

GRADUATE STUDENT INFORMATION
MECHANICAL AND INDUSTRIAL ENGINEERING
DEPARTMENT

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I PURPOSE AND SCOPE

We are delighted that you have decided to pursue graduate studies here in the Department of Mechanical and Industrial Engineering at the University of Massachusetts Amherst. We wish you well throughout your program of studies and encourage you to keep in close touch with your advisor and the Graduate Program Director.

The purpose of this booklet is to provide graduate students and faculty with a source of information about the regulations and policies of the MIE Department regarding its graduate program. This booklet supplements information in the Graduate Catalog and in the "Graduate School Handbook" published by the Graduate School. New students should carefully read all three of these documents. **IT IS THE RESPONSIBILITY OF EACH STUDENT TO SEE THAT ALL OF THE GUIDELINES SET BY THE GRADUATE SCHOOL AND THE DEPARTMENT ARE FOLLOWED.** Any exception to the policy should be approved in writing by the MIE Graduate Program Director (GPD)¹.

When questions arise which are not answered in this or one of the publications noted, students are requested to first consult with their advisors, then, if necessary, with the GPD, and finally, with the Department Head. All members of the faculty and the Department Head welcome questions or comments from graduate students on academic or personal matters.

II THE FIRST STEP FOR NEW STUDENTS

New students should report to Dorothy Adams in the MIE Department Graduate Office (Engineering Lab 208F) for information and instructions. There is a mandatory orientation meeting for all new graduate students in the MIE Department during the first week of classes.

Students should also familiarize themselves with the obligations to acknowledge their sources in all their class and research writing. The rules and syntax of citations can be found in any number of writing guides; the formatting is less important than the standards of behavior. Academic integrity requires that when we use the ideas or words of previous works, we use footnotes, endnotes, or quotation marks, as appropriate. Though the process of citing and acknowledging prior work may not have been part of a new student's education, once entering UMass, the new graduate student must abide by the Code of Conduct which explicitly forbids plagiarism.

III THE M.S. PROGRAMS (30 CREDITS)

A. Entrance Requirements

M.S. Degree Programs may be entered directly by qualified students with B.S. degrees from any engineering discipline, metallurgy or materials, physics, or mathematics. Students with degrees in other disciplines should consult the GPD for advice on preparing for graduate courses.

B. Course Requirements for a Master of Science Degree in Mechanical Engineering

In addition to the Graduate School requirements stated in the Graduate School Catalog, all M.S. students in the Mechanical Engineering program are required to take a minimum of four (4) MIE courses from the list of eight courses shown below:

- 601 Advanced Thermodynamics or ChE 621 Thermodynamics
- 603 Numerical Methods
- 605 Introduction to Finite Element Modeling, Analysis, and Applications
- 607 Advanced Fluid Dynamics I

¹ Professor David Schmidt (210B Marston) is the current MIE Graduate Program Director.

609 Mechanical Property of Materials
616 Design Optimization
643 Mechatronics or 641 Vibrations
644 Applied Data Analysis

C. Course Requirements for a Master of Science Degree in Industrial Engineering and Operations Research

In addition to the Graduate School requirements stated in the Graduate School Catalog, all M.S. students in the Industrial Engineering and Operations Research Program are required to take the following six courses:

MIE 620 Linear Programming
MIE 651 Production Planning I or MIE 697Q Logistics
MIE 657 Human Factors Design Engineering
MIE 684 Stochastic Processes in Industrial Engineering
MIE 754 Economic Decision Making for Engineers II
A graduate level course in the student's area of interest approved by their advisor.

All entering M.S. students who are planning to enroll in the industrial engineering and operations research program are expected to have successfully completed courses covering the following topics: linear programming, probability and statistics, and production planning. Entering M.S. students who have not taken a course at the undergraduate level covering these topics must get permission from the instructor of a required course to enroll. The instructor, at his or her discretion, may require that the student take a prerequisite (e.g., linear algebra may be required as a prerequisite for linear programming). This prerequisite will not count for credit towards the graduate program requirements if it is an undergraduate level course. Those students who need make-up courses should expect to take at least one additional semester to complete their graduate degree.

All students are expected to attend the weekly Industrial Engineering seminar (M & I ENG 794).

D. Dual Master in Business Administration and Industrial Engineering and Operations Research or Mechanical Engineering (72 Credits)

Students in the dual master program must complete the 30 credits required for a Master of Science degree in Industrial Engineering and Operations Research or Mechanical Engineering, as specified above, plus 42 credits in the Isenberg School of Management (36 credits of core MBA course requirements and an industry practicum).

E. Thesis Option or Coursework Only Option

Incoming students may choose one of two options for earning their Master's of Science in Mechanical Engineering or Master's of Science in Industrial Engineering and Operations Research: (1) The Thesis option or the (2) Coursework option. Students must declare which option they are pursuing when applying to UMass. Students are not generally permitted to switch from one option to the other; they may only switch options with the permission of the MIE Graduate Program Director.

E.1. Thesis Option for both ME and IEOR

All M.S. students who choose the Thesis Option are required to plan and carry out a research, design, or development thesis (MIE 699) or project (MIE 688) of nine credits and 21 course credits.

E.2. Master of Science in Mechanical Engineering, Coursework Only Option

The requirements of the Coursework option are:

- 1) The student must successfully complete at least 30 graduate (500 level or above) credits. Thesis or project credits do not count towards this total.
- 2) At least 21 credits must be at the 600 level or above.
- 3) At least 21 credits must be Mechanical and Industrial Engineering courses.
- 4) A maximum of 6 credits can be for independent study.
- 5) The student must take four of the MIE Core courses (see the Thesis option description for a listing).
- 6) Credits that apply to any other degree program, with the exception of graduate certificate programs, cannot be applied to this degree.

Master's students who select the coursework option will not usually be considered for assistantships or tuition waivers.

E.3. Master of Science in Industrial Engineering & Operations Research, Coursework Only Option

The requirements of the Coursework Only option are:

- 1) The student must successfully complete at least 30 graduate (500 level or above) credits. Thesis or project credits do not count towards this total.
- 2) At least 21 credits must be at the 600 level or above.
- 3) At least 18 credits must be Mechanical and Industrial Engineering courses.
- 4) A maximum of 6 credits can be for independent study.
- 5) The student must take the five named IEOR core courses required for the MS Thesis option (see above for a listing).
- 6) Credits that apply to any other degree program, with the exception of graduate certificate programs, cannot be applied to this degree.

Master's students who select the Coursework Only option will not usually be considered for assistantships or tuition waivers.

F. Other Course Requirements

All students will need to take additional courses beyond the core courses (the total credits must reach 30); The exact number of additional courses required will depend on the number of credits that the student enrolls in core courses and as part of the thesis or project.

G. M.S. Thesis

An M.S. Thesis may be a research, design or development project. A copy of the Thesis outline must be approved by the student's committee and put on file with the GPD and forwarded to the Graduate School at least four months prior to the defense. The Thesis guidelines prepared by the Graduate School must be followed. The format for the Thesis must follow the instructions from the Graduate School Catalog and the Graduate School Handbook.

H. M.S. Project

An M.S. Project has the same features as the Thesis, except that its final report does not have to abide by the Graduate School formatting guidelines. As in the case of the Thesis, the candidate must obtain written

approval by all members of his/her Project Committee for his/her proposed project outline. The project outline, with the cover sheet bearing the signatures of the Committee members and the date of the Project Committee's meeting with the candidate, must be forwarded to the GPD for the student's file. A copy of the final report, along with a cover sheet bearing the signatures of the committee members indicating their approval as to style and content, must be submitted to the Graduate Program Office before the Certificate of Eligibility for a Master's Degree form may be signed by the Department Head. The project report must be bound with a **gray** hardcover and gold lettering, and it must be provided to the Graduate Program Office for the Department files. Hardcover and lettering format must conform to the existing M.S. Projects already on file.

The Master's project is to serve as a conduit for problem solving. It is expected to satisfy the following objectives:

- Provide the opportunity to practice methodical problem solving of viable industrial and/or technical problems,
- Foster innovation and research, and
- Provide the format to practice report writing and presentation skills.

I. Thesis/Project Defense

The candidate must defend his or her thesis/project. This defense is judged by the Thesis/Project Committee. A copy of the thesis/project must be given to the members of the Committee at least two weeks before the defense. The Thesis/Project committee must be approved in writing by the GPD and the defense schedule must be announced at least 7 days prior to the exam. A notice of the defense shall be sent to all MIE faculty members.

J. Graduating

At the end of this brochure is a checklist for the graduation process.

K. M.S. Timeline

The following is the suggested timeline. Some deadlines are firm; others are more flexible. It is your obligation to read the Handbook thoroughly. However, we hope that this helps you plan your schedule. Please do not hesitate to ask us questions at any point in time.

K.1 First Semester: Select Permanent Advisor

See G.1.

K.2 First Semester: Prepare Program of Study

See G.2.

K.3. End of First Year: Register for Thesis/Project Credit

See G.3.

K.4 End of First Year: Select Thesis/Project Committee

See G.2.

K.5 End of Second Year: Complete Required/Elective Courses

See B (M.E.), C (I.E.)

K.6 Four Months Prior to Defense: Thesis/Project Outline

See G.4.

K.7 Set the Date of Defense.

K.8 Two Weeks Prior to Defense: Deliver Thesis/Project to Committee

See K.

K.9 After Defense: Hand in Copy of Thesis/Project to Graduate Program Office

See I (Master's Thesis) or J (Master's Project)

IV THE PH.D. PROGRAM

A. General Requirements

The Ph.D. program is intended to prepare the student for a research career in industry, academia or national laboratories. A dissertation, presenting significant new information, is the primary requirement of the degree. Other requirements for the Ph.D. degree include:

- A minimum of one academic year in residency. Residency is defined as one continuous academic year of full-time graduate work (9 credits per semester).
- A certification by the candidate's Guidance Committee that the candidate is qualified to pursue the Ph.D. degree.
- Successful completion of a preliminary comprehensive examination.
- An approved dissertation proposal.
- Completion of an approved course curriculum
- A Ph.D. dissertation.
- A final oral examination.

Additional University requirements are listed in the Graduate School Bulletin. Note that the MIE Department does not require a student to demonstrate competency in a foreign language.

Students considering a doctoral degree are strongly encouraged to obtain an M.S. degree in Mechanical or Industrial Engineering before attempting to establish candidacy in the Ph.D. program. Although this is not a requirement, experience indicates that previous research experience provides better preparation for Ph.D. dissertation work.

B. Curricular Components for Ph.D. Degree

The minimum course requirement for the Ph.D. degree is enrollment in 18 credits of MIE 899 (Doctoral Dissertation). Ph.D. students must also formulate a complete and coherent program of coursework approved by the student's Dissertation Committee and the GPD.

B.1 Ph.D. in ME

Approved programs must include at least 9 course credits (audited courses do not count) beyond the requirements of M.S. Degree. Only one of the required courses can be at the 500 level. These and other courses (including ones taken as part of a M.S. Degree Program) should comprise a major concentration and a minor concentration. A concentration consists of a series of at least 9 course credits. Students who do not hold a Masters degree will take a total of 30 credits which include the 9 PhD course credits.

B.2 Ph.D. in IEOR

Approved programs must include courses which have covered the material in the six required courses for the M.S. degree in I.E.O.R. Normally, students receiving a master's degree in MIE will have completed all required courses. Additionally, all students in the Industrial Engineering program are expected to attend the weekly seminar.

C. The MIE Ph.D. Preliminary Comprehensive Exam

Each Student enrolled in the Ph.D. program must pass a preliminary comprehensive exam prior to their fourth semester as a Ph.D. student. The purpose of the preliminary comprehensive exam, also referred to as "the qualifier" is to ensure that the student is qualified in both knowledge and critical thinking skills to pursue a Ph.D. in his/her intended field of study.

C.1 Administration and Registration

The Mechanical & Industrial Engineering GPD coordinates the administration of the exam.

Students notify the MIE GPD of their intention to take the exam. Students who have done so will be notified by the GPD as to the date and format of the exam.

C.2 Format and Scope

The candidate's advisor and the GPD will determine the format of each candidate's exam. Each candidate's exam will consist of a written exam and may also include an oral exam. The written exam may consist of an in-class written exam and/or a take-home exam. Oral exams may be scheduled as a regular qualifier exam or may be scheduled after a review of the candidate's written exam. In-class exams shall not exceed two days nor six hours on any one day. Take-home exams shall not exceed five days.

The scope of the exam will be established by the candidate's examining committee and the GPD to test general knowledge and critical thinking skills in the candidate's intended area of study.

C.3 Outcomes

The three possible outcomes of the exam are: Pass, Conditional Pass, and Fail. A Conditional Pass indicates that the examination committee and the GPD have concluded that the student is qualified to pursue a Ph.D., provided that the student improves his/her knowledge and skills in one or more specific areas. In those cases, the examination committee and the GPD will specify a remedial course of action intended to address the weakness identified from the preliminary comprehensive exam. The remediation plan can include, but is not limited to course work, independent study projects and subsequent focused examination. A grade of Conditional Pass shall be converted to Pass upon successful completion of the remediation plan within the specified time period. Otherwise, Conditional Pass will be automatically converted to Fail.

A student who has failed in his/her first attempt to pass the preliminary comprehensive exam may petition the Graduate Program Committee to retake the exam.

D. MIE PhD Dissertation

After successful completion of the preliminary comprehensive examination, the GPD shall recommend to the Dean of the Graduate School the names of at least three members of the graduate faculty to serve as the dissertation committee. The dissertation committee shall consist of at least three members of the graduate faculty including an "outside member" (as defined by the Graduate School) and at least two regular MIE faculty members.

The Ph.D. candidate submits a dissertation proposal to each member of the dissertation committee. The candidate makes an oral presentation of his/her proposal at a meeting of the dissertation committee, and upon unanimous approval by the committee, a copy of the proposal signed by all members shall be submitted to the Dean of the Graduate School. This copy shall be accompanied by a request for formal appointment of the dissertation committee by the Graduate School. This action must take place at least seven months prior to the final oral examination.

When all members of the dissertation committee have approved a draft of the dissertation, the final oral examination may be scheduled. See the Graduate School Handbook for scheduling regulations. Notice of the final oral examination must be given to all MIE faculty at least seven days prior to the exam.

The final oral examination is primarily, but not necessarily, limited to a dissertation defense. The examination will be conducted by the candidate's dissertation committee (all members of which must be present). To pass, the candidate must receive the unanimous vote of the dissertation committee. All other graduate faculty members are encouraged to attend, but with non-voting status. Two negative votes shall fail the examination. A single negative vote will result in the degree being held in abeyance pending review and action by the Graduate Council of the Graduate School.

See the Graduate School Handbook for detailed regulations on preparation and submission of the dissertation copies, payments of fees, etc.

E. Other Requirements and Procedures applicable to all PhD students

New Ph.D. students who are not committed through a GRA to a specific faculty member for research will be assigned the GPD as a Temporary Advisor until a Dissertation Committee Chairperson has been determined. Students are urged to begin as soon as possible to explore dissertation research topics with the faculty.

- The Department has a seminar program that greatly enhances the graduate program. Graduate students are encouraged to attend these programs regularly.
- Successful doctoral study requires conscientious and competent effort. It is expected that Fellowship and Assistantship holders will devote full time to their studies and will not hold other part-time jobs or be simultaneously enrolled in another degree program. Students not supported by the Department or University are required to notify their advisor and the GPD of any part-time employment.
- In addition to other required copies, a final copy of the Dissertation must be given to the Department Head for the Department records.

F. Ph.D. Timeline

The following is the suggested timeline. Some deadlines are firm; others are more flexible. It is your obligation to read the Handbook thoroughly. However, we hope that this helps you plan your schedule. Please do not hesitate to ask us questions at any point in time.

F.1 First Semester: Select Permanent Advisor

F.2 First Semester: Prepare Program of Study

See B.

F.3. End of First Year: Register for Dissertation Credits

See B.

F.4 End of First Year: Select Dissertation Committee

See D.

F.5 End of Second Year: Take Comprehensive Exam

See C

F.6 Seven Months Prior to Defense: Dissertation Outline

See D

F.7 Notify Graduate Program Office of Defense Date

See D.

F.8 After Defense: Hand in Copy of Dissertation to Graduate Program Office

See E.

V GENERAL INFORMATION FOR THESIS-OPTION MS AND ALL PHD STUDENTS

A. Other Requirements and Procedures Applicable to all M.S. Students

1. Students must ideally select a permanent thesis advisor before registering for classes for the first time. A student arriving with support in the form of a research assistantship will have his/her project director as his/her thesis or project committee chairperson and also his/her advisor. Other students with fellowship support or teaching assistantship or non-supported students should find a permanent thesis/project advisor within two months and in no case later than the end of their first semester. The GPD may act as a temporary advisor for new students who have not yet found a permanent advisor before first time registration. Registration must always have the approval of the student's advisor.

General information about the faculty and their research interests can be found on the department web site.

2. Students are expected to prepare a coherent program of study during the first semester and before pre-registration for the second semester. This program of study should be approved by the student's advisor in consultation with the members of his/her M.S. committee. Curriculum programs which deviate from requirements specified herein must be approved in writing by the GPD and recorded on the student's curriculum form. The M.S. Thesis or Project Committee members are selected by the student with advice and approval of the Committee Chairperson and the GPD. The Committees shall consist of three members of the Graduate Faculty, at least two of whom must be regular MIE faculty and at least one of whom must be outside the immediate area of specialization of the thesis or project. Thesis and project committee members must agree to serve before they are appointed to the committee.

3. Advisors will normally require that students register for three credits of Thesis or Project in their first or second semester. Teaching Assistants may not register for more than a total of thirteen credits per semester.

4. A copy of a thesis outline or project proposal must be approved by the student's committee and must be put on file in the Department office at least four months prior to the Thesis or Project defense. The thesis outline must also be put on file in the Graduate School Office (see the Graduate School Handbook).

5. In addition to other required copies, a bound copy of the **final project report** must be given to the Department Head for the Department records. Bound copies of the final thesis or dissertation are no longer required since electronic copies are available through the library. Binding specifications are available at the Graduate Program Office.

6. ASSISTANTSHIP AND FELLOWSHIP HOLDERS **ARE NOT PERMITTED TO HOLD OTHER PART-TIME JOBS OR TO BE SIMULTANEOUSLY ENROLLED IN ANOTHER DEGREE PROGRAM WITHOUT THE WRITTEN PERMISSION OF THEIR ACADEMIC ADVISOR AND THE GPD.** Students not supported by the Department or University are required to notify their advisors and the GPD of any part-time employment.

B. Role of the Graduate Committees

The MIE Graduate Committee, chaired by the GPD, administers all MIE Graduate Degree Programs. Subject to final approval by the Department Head, the Graduate Committee is responsible for all aspects of the graduate programs and approves plans of study, Dissertation Committee appointments, recommendations for degrees, etc. The committee also administers the Preliminary Comprehensive (Qualifying) exam for students obtaining their Ph.D. degree in Mechanical and Industrial Engineering.

Advisors and Dissertation Committees are subordinate to the Graduate Committee though it is rare that the recommendations of the Advisor and Dissertation Committee are not accepted.

C. Graduate Teaching Assistants

Subject to the availability of qualified applicants, all graduate teaching assistantships are initially offered to new incoming graduate students. Graduate teaching assistantships are offered not only to fulfill immediate departmental needs, but also to advance the degree programs of graduate students and the teaching needs of the department. Students who have appointments as GTAs will be assigned duties and a faculty supervisor by the Department Head. This work will normally require between 15 and 20 hours of work each week. It is the policy of this department not to renew teaching assistantships and teaching associateships beyond the time period stated in the initial contract. All additional financial support is generally provided by a student's academic advisor, or through fellowships.

D. Graduate Research Assistants

All applicants for admission to the graduate program in MIE are automatically considered for teaching and research assistantships in the department. Each applicant's qualifications are first reviewed by the Graduate Committee. The Graduate Committee then submits the application forms for the top candidates for further review by individual faculty members whose interests most closely parallel those of the applicants. The decision to offer a research assistantship is made by individual faculty members and is based upon the availability of funds and the qualifications of each applicant. The stipends received for this work vary with the type of work, the amount of time involved and the availability of funds. These details are normally worked out between the student and his project director and generally exclude the possibility of the student taking any part-time or full-time consulting jobs.

The topic or program of the GRA work will usually coincide with that of the student's thesis, dissertation, or project, so the project director will automatically assume the role of the student's advisor as well..

Continuation of the research assistantship is based upon the continued availability of funds and satisfactory performance by the student in both research and course work.

Graduate students who are already in the program and who do not have a research assistantship are encouraged to contact the GPD to find out which faculty members have interests that closely parallel those of the student. It is the student's responsibility, however, to contact individual faculty members and inform them of his/her interests and availability. The decision to offer an assistantship to a student always rests with the principal investigator (faculty member).

VI DEGREE COMPLETION PROCEDURE

For timely completion of degrees it is essential that all of the Graduate School's policies and deadlines are adhered to. The forms need to be completed and those to be submitted to the Graduate School need to have original signatures in black ink. It is important to note that a committee is not official until recommended by the GPD and appointed by the Graduate School. Also of particular importance is to have an approved copy of the thesis/dissertation outline on file with the Graduate school 4 months prior to the MS thesis defense and 7 months prior to the final PhD oral exam. The Graduate School will not allow a defense to be scheduled if the above time line is not followed.

It is the student's responsibility to see that all memos and forms are sent to the department and the graduate school.

A. M.S. Programs

The student should obtain a Masters Graduation Eligibility Form from the Graduate School's website at www.umass.edu/gradschool under Policies and Forms. This form should be completed and submitted to the Graduate Program Office (ELAB 208F) for approval. Please note that this form will only be accepted upon approval of the original M.S. Thesis or Project by all committee members.

B. Ph.D Program

The procedure parallels the M.S. program above. The Graduate School requires additional forms to be completed by the candidate. These forms are listed on the Checklist for Doctoral Degree under Policies and Forms.