University of Rochester

Hajim School of Engineering and Applied Sciences

Department of Mechanical Engineering

Graduate Studies Handbook

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Welcome to the Department of Mechanical Engineering

Welcome to the University of Rochester's Department of Mechanical Engineering! We are happy that you have chosen to continue your studies with us. This handbook will explain the formal requirements for completion of your graduate degree in Mechanical Engineering. It supplements and clarifies the general University requirements spelled out in the Official Bulletin for Graduate Studies and the Regulations and University Policies available on the University web site at www.rochester.edu/GradBulletin/.

During your first year, you will be assigned a faculty advisor to assist you in course selection and preparation for either your first-year exam or further research. You may be asked to assist with teaching or grading of an undergraduate course. Teaching assignments are made by the department to best match the needs of the faculty and students. If you have a specific preference, speak to the Graduate Coordinator or your advisor.

We hope you will take advantage of the many opportunities available here in Rochester. Several weekly seminar series will help you become more familiar with the nature of our research. Attending many of our seminars and social events is an excellent way to meet some of the faculty and other graduate students. If you are interested in learning more about a particular area, speak to your advisor or one of the office staff to find out about arranging a meeting or a tour. Finding an excellent match with your interests is an important step toward your success.

The Master of Science (MS) Degree

General requirements

The MS degree requires 30 semester hours of graduate credit. No more than 10 credits may be transferred from non-matriculated study at the University of Rochester or from an outside institution. There are two routes to the degree: Plan A (thesis) and Plan B (examination). Every student must complete a Program of Study form (available from the Graduate Coordinator). This form is completed with the help of your academic advisor and is then given to the Graduate Coordinator. The completed form goes to the Dean's office for signature and distribution to appropriate offices. The Program of Study should be completed as soon as possible, but in no case later than the end of the second semester. This form may be updated by submitting a revised Program of Study, which must be approved by your advisor. When selecting Plan A (thesis) or Plan B (coursework), make sure you discuss your options with the graduate coordinator first.

Plan A requirements

Plan A requires a written dissertation prepared by the student under the supervision of his/her advisor. The thesis research represents 6 to 12 hours of the 30 required credit hours. Of the remaining 18 to 24 hours, at least 16 must be in graduate courses, and at least 12 of these 16 must be M.E. courses. The formal defense of the dissertation takes place after the completion of all course work, and the student must be registered for the semester in which the defense takes place. The remainder of this section deals with the defense.

Arranging for the defense: When you and your advisor begin thinking about defending, remember to contact the Graduate Coordinator. He/she will guide you through the administrative requirements. He/she will also explain specific deadlines for the defense and dissertation submission for each degree conferral date, i.e. March, May, and December. You must be registered for the semester in which you defend.

Scheduling and paperwork: Check with the Graduate Coordinator for allowable defense dates. Your dissertation must be submitted to your committee and to the Dean's office at least two weeks

(10 working days) before you defend. The following bound (spiral or tape binding) copies are required: 1 hard copy to each committee member, unless an electronic copy is requested, and 1 bound copy to the Graduate Coordinator along with the following paperwork:

- Program of Study (must be up to date).
- Nomination of Committee form.

When your committee has been selected and a date chosen, you need to have the Graduate Coordinator schedule the conference room for your defense and provide an abstract of your thesis defense. SHOW COPY OF EXAM APPOINTMENT FORM

The examining committee: You will defend your dissertation before a committee of two full-time professors from the M.E. department and one full-time professor from outside the department. The committee members are selected by your advisor, with input from you, and then it is your responsibility to contact these faculty members and to complete the appropriate form.

Final copies of the dissertation: You must turn in two corrected unbound copies of your dissertation after successful completion of the defense. These copies will go to the Dean's Office. Also, give the Graduate Coordinator a third bound copy for your folder. It is also customary to provide bound copies to the members of your examining committee.

Plan B requirements

30 credits of graduate coursework are required for the Plan B M.S. Program. Of these 30 credits, no more than 6 can be in research, reading or internship-type courses at 400-level or higher. 20 credits must be in formal courses in the Department of Mechanical Engineering. The M.S. Program of Study form must be completed by the time you have finished 12 credit hours of course work. You must take a comprehensive oral examination at the end of your course work. No examination appointment form is necessary, but you must see the Graduate Coordinator as well as your faculty advisor to schedule this exam. Degrees are conferred in March, May, and December. See the Graduate Coordinator for deadlines for the appropriate semester to confirm completion of program requirements.

The oral examination: The examination questions will be based on the courses you have taken and any research you have done (if applicable). The examining committee consists of your advisor and one other M.E. faculty member, chosen by your advisor. It is your responsibility to find the members of your examining committee, in consultation with your faculty advisor. At the end of the examination, which lasts approximately 2 hours, the committee will complete an examination report form for the Dean's Office. SHOW WHAT THE REPORT FORM LOOKS LIKE

The Doctor of Philosophy (Ph.D.) Degree

General requirements

The Ph.D. degree requires 90 credit hours of graduate credit. Students holding a Master of Science degree receive 30 credit hours toward the total of 90 (see page 81 of the Graduate Bulletin). Students are required to take at least 32 hours of coursework at the 400 level or higher, of which at least 24 credit hours must be mechanical engineering courses. Research and work towards the dissertation cover the remainder of the credit hours. No more than 10 of credit hours may be transferred from non-matriculated work at Rochester. There are three examinations during the Ph.D. program: the preliminary examination at the end of the first full academic year of study, the qualifying examination, typically taken at the end of the second year or during the third year, and the final oral thesis defense examination.

The Ph.D. Program of Study form should be completed and approved within two years of matriculation (four semesters). The student completes this form in consultation with his/her advisor. It requires the signature of the student research advisor and is then forwarded to the Dean's Office. The program of study can be modified if necessary with a Program Change Notice form. The program of study must be completed and approved before the student can take the qualifying examination.

Full-time study: Full time study is defined as no fewer than 12 credit hours per semester, or an equivalent combination of coursework, research, and/or teaching.

Part-time study: All other students are considered to be part time. Part time students

must satisfy the same requirements as full-time students, as well as a residency requirement. Part time study is defined as registration for fewer than 12 credit hours per semester, or an equivalent number of credit hours of coursework, research, and/or teaching.

For questions regarding full or part time status or residency requirements see graduate student bulletin and contact the Graduate Coordinator.

Finding an advisor *(research supervisor) and getting started*

We encourage all students to start research as soon as possible under the supervision of a suitable advisor. You will be assigned a faculty advisor when you arrive at Rochester, but the advisor may not be your eventual research supervisor, whom you should identify by the end of your first year here, preferably before taking the preliminary examination. (This exam is discussed below.) It is important that you find a good match between your academic interests and those of your faculty advisor, that your advisor is willing to accept you as a graduate research assistant, and that he/she can provide your graduate stipend. It is also important that you contact every faculty member in the Department to explore all possibilities for an academic adviser. Often first year students will presume that only one or two faculty members may serve as their advisor, thus excluding the rest of the faculty. This is acceptable if a good match between student and faculty is made, but no possibilities should be left unexplored. First year graduate students are required to contact all faculty in the Department to explore the possibilities for research. Potential research advisors can be from outside the mechanical engineering department. A list of the faculty is provided to keep track of the faculty contacted. You may meet with the faculty either before or after taking the Preliminary Exam. When you have met with a faculty member and discussed research possibilities together, please have him or her sign next to their name to confirm that such contact has occurred. When you have met with the entire faculty, you should be able to identify your advisor. Be sure to return this list to the Graduate Coordinator, identifying your research advisor. We recommend that the procedure be followed before the Preliminary Exam, and in any event, no later than June 1st. For any questions regarding finding a research advisor please contact the graduate coordinator.

Once you have identified your research advisor following the steps above, it is equally important that you begin your research: for overall efficiency, it is best to conduct you

research in parallel with your course work. Summer is a good time for conducting research as there are no classes or teaching duties. Making a strong start on research during the first year is a significant sign of good progress towards your degree.

Ph.D. first year preliminary examination

First year Ph.D. students take this exam after their second semester, usually in late May. This examination is required of all first year Ph.D. students, and successful completion of this examination is required for formal admission into the Ph.D. program in the Department of Mechanical Engineering.

The examination: The examination process takes fourteen days. The examining committee consists of three Mechanical Engineering faculty members, one of whom is the student's academic research advisor. The examining committee and the date and time of the examination are chosen by the department Graduate Committee. You must have a GPA > 3.0 in 400-level courses and confirm with the Graduate Coordinator by a specified date to take the exam.

Each student will be given three published research papers for review. The Graduate Committee chooses these from papers submitted by the faculty. The papers will generally be in the student's broad area of research. The papers will usually be no more than two years old and will not be necessarily directly related to the student's chosen area of research, nor will they have been written by a member of the ME faculty. Within three days of receiving the papers, each student must inform the Graduate Coordinator in writing which of the three papers he/she has chosen to serve as a basis for the preliminary exam. Seven days later, each student must submit to the Graduate Coordinator a PDF copy of a carefully written document containing three sections of equal importance:

- Questions addressed by the author(s). Identify the questions addressed in the article and the reasons for examining these questions.
- Critical appraisal of the article. Discuss the author's contribution to the solution of those questions and the significance of this contribution.

- Proposal for additional research. Propose, in concrete terms, new research that might be done to extend or improve upon the study presented in the article.

This document should be no longer than ten pages (12 pt double-spaced, 1-inch margins), excluding figures and references.

Approximately three days after submission of the document, each student will appear before a three-member faculty examining committee for an oral examination presenting the document (the date, time, place, and examining committee members for each exam will be selected by the Graduate Committee). Each exam will begin with a 20-minute oral presentation by the student followed by questions from the examining committee. The entire examination will last about two hours. At the end of the exam the committee will submit a written report on the examination.

When all the examinations have been given, the entire M.E. faculty meets to decide the outcome, based on the following:

- Student's ability to evaluate published research critically.
- Student's creativity in suggesting new lines of research.
- Strength of the written document with respect to both content and style.
- Performance in the oral examination.
- Course grades.
- Performance as teaching assistant, if applicable.

Students will be notified of the results in writing.

Ph.D. dissertation advisory committee

Each Ph.D. student shall have a dissertation advisory committee consisting of a research advisor, at least one other faculty member in the Department, and at least one faculty member from another department. This committee shall be appointed during the student’s second year of study (or earlier). It is recommended that this committee meet at least once during that

year. The membership of the committee shall be approved by the Department chair and reported to the dean of graduate studies. The goal of the recommended annual meeting is to evaluate the student's progress and offer advice, and, if advisable, a written record of the meeting may be placed in the student's file. (A standard form for this written record is available from the Graduate Coordinator.)

Ph.D. qualifying examination

The purpose of the qualifying examination is to determine whether the student is fully prepared to undertake original research in the chosen area. This examination must be taken by the end of the third year of graduate study. The basis for the examination is a written research proposal prepared by the student, describing the current state of knowledge of a particular research topic, and outlining a research program that will lead to a satisfactory dissertation. Note that the student *need not demonstrate significant progress in the proposed research but must demonstrate a* thorough understanding of the problem and present a sound plan of attack. Contact the Graduate Coordinator as soon as you and your advisor begin thinking about scheduling your qualifying examination. There are several things you must complete before you can take this examination. The Graduate Coordinator can guide you through this process.

- You must submit your written research proposal to your examining committee and your committee nomination form to the Dean's Office at least 15 working days (weekends and University holidays not included) before the examination is to take place.
- Your program of study, which should have been completed at the end of your 3rd year must be on file, and updated if necessary.

The examining committee: The committee will consist of a minimum of three full-time faculty members of professorial rank. Two must be from within the Department of Mechanical Engineering and one from outside the Department. The committee members are chosen by your advisor in consultation with you: often they are the members of your advisory committee.

Typical examination format: The student will give an oral presentation giving an overview of

the research proposal, for the first 20-30 minutes. Occasionally, this oral presentation is made to a larger audience as part of the M.E. seminar series. If so, then additional background material may be appropriate, and an abstract should be given to the Graduate Coordinator a week in advance for posting. The committee will then examine the student orally in a closed session. A typical examination will take between two and three hours. The candidate is judged on the significance of the research proposed, the written and oral presentation, understanding of the fundamental issues, the ability to apply the background from formal course work to problems related to the proposal, and demonstration of critical assessment of results. It is important to recognize that while the written proposal serves as a focus for the oral examination, questions about related areas can also be raised.

The final Ph.D. thesis defense and oral examination

Before you can start planning your thesis defense, you must:

- Complete all courses, exams, and research credit requirements
- Ensure that required paperwork is updated (for example, program of study)
- Meet with your advisory committee to ensure that the committee agrees that the work/research is ready to defend
- Decide on a date for the defense
- Inform your graduate coordinator that you have started the process to prepare for the defense

Selecting a Date for the Ph.D. Thesis Defense

You should begin scheduling the actual defense date three months in advance to ensure that your advisor, committee members, and committee chair are able to be present in the Ph.D. defense, and that rooms are available on the date and time selected.

Defenses can be held on any day the University's Graduate Studies Office is open (not

weekends, evenings, holidays, or the days between December 24 and January 2.) Check the academic calendar for important dates and deadlines.

Use the Ph.D. date calculator to determine the deadline dates for getting your paperwork to the Graduate Studies Office and Ph.D. thesis defense committee.

After selecting a date for your Ph.D. thesis defense:

1. Meet with the Graduate Coordinator
   - Your graduate coordinator will advise you of any program-specific requirements for the thesis defense as well as work with you on the details of the thesis defense and oral examination.
   - The coordinator also will help you with scheduling the room for your thesis defense.

2. Submit Thesis and Committee Participants Names to Graduate Coordinator
   - The examining committee must consist of at least two full-time faculty from M.E. and one full-time faculty outside M.E.
   - When all Ph.D. thesis defense committee members and your committee chair agree to a specific date and time, inform your graduate coordinator as soon as you possible can, but no less than six weeks prior to your defense date.

3. Approval by the Ph.D. Thesis Defense Committee
   - You should provide your committee members at least one week notice before you submit your thesis for review.

4. Nominate a Faculty Member to serve as Chair for your Ph.D. Thesis Defense

- A chair is appointed for each Ph.D. thesis defense to monitor and promote fairness and rigor in the conduct of the defense. To help eliminate pre-established judgments on the candidate's work, the chair must be from a different program/department from the student.

- The student must identify a faculty member to serve as chair of the student's Ph.D. defense. The choice of the chair is often done in consultation with the student's advisor. The chair must be:

  A current full-time faculty member at assistant professor rank or higher.

  Outside the program/department offering the Ph.D. program, or outside the student's advisor's department.

  Someone who has not had previous involvement in your research.

  Willing and available to participate in the student's Ph.D. defense examination.

- The selection of the chair of the Ph.D. defense is subject to the approval of the department/program, the AS&E dean of graduate studies, and the University dean of graduate studies.

- The chair of the Ph.D. thesis defense committee must be physically present during the entire defense, including the public oral presentation (if applicable) and the closed examination and questioning session. The chair is welcome to read and comment on the dissertation and/or defense oral presentation, but this is not required. The chair does not need to be an expert in the student's research area.

5. Approval of Dissertation by the Chair of the Ph.D. Thesis Defense Committee

It is the student's responsibility to get a copy of the final dissertation to the chair at least one week prior to the defense.

6. Approval of Dissertation by AS&E Graduate Studies

The Dean of Graduate Studies in Arts, Science and Engineering will need at least two weeks prior to the defense date to review your dissertation.

7. Approval of Dissertation by the University Dean of Graduate Studies

The University Dean of Graduate Studies will need at least one week prior to the defense date to review and approve your dissertation.

8. Notification

The student, the student's advisor, the members of the examination committee, the chair of the committee, and the graduate coordinator will be notified by the University Dean of Graduate Studies before the Ph.D. defense examination takes place.

Format of the Ph.D. defense examination

The oral examination typically consists of two parts. The first part consists of an open seminar, followed by a closed session with the examination committee and its chair.

The first 45 minutes of the examination are typically a seminar open to the public. The student's presentation should last approximately 30-35 minutes. An additional 10-15 minutes should be allowed for questions from the audience. Slides, charts, and visual aids for the seminar are encouraged.

Following the open session, the student and the examination committee will then adjourn for a closed session where the second part of the exam is conducted. The committee will scrutinize the student's thesis and presentation including comprehension, execution, description, and interpretation of the research described in the thesis.

After successful completion of the final oral examination, the student may be required to make necessary revisions or corrections in the dissertation. When corrections are required, and after they are completed, they are reviewed by the thesis advisor (or a designated member of the examining committee.) One electronic copy is then submitted to the University Dean of Graduate Studies. A student's stipend typically ends when the final or corrected copy of the dissertation is turned in, or until degree conferral.

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