

# Department of Chemical Engineering

## Graduate Program Regulations

University of Massachusetts Amherst  
Amherst, Massachusetts

In this document, the Department of Chemical Engineering presents its:

- I. Requirements and procedures for the Ph.D. degree;
- II. Requirements for the M.S. degree; and
- III. General regulations of the graduate program.

While the information that follows is intended to be quite complete, additional details are provided in the *Graduate School Bulletin* and *Graduate Student Handbook*. To access these, go to <http://www.umass.edu/gradschool/>. Questions may arise which are not covered here, and in those cases, do not hesitate to ask for help from your thesis advisor and the departmental graduate program director.

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## I. DOCTOR OF PHILOSOPHY (Ph.D.)

### A. Ph.D. Degree Requirements

1. Complete graduate credits as following:
  - a. Earn a grade of B or better in four of the core 600-level Chemical Engineering courses:

ChE 621	Thermodynamics I
ChE 625	Chemical Reactor Design
ChE 633	Transport Processes
ChE 661	Advanced Analysis I
  - b. Pass the following courses, taken on a pass/fail basis:
    - Two credits of research-group seminar (ChE 791x) with your advisor in each semester after the first;
    - One credit of departmental seminar (ChE 691) in each semester in residence;
    - A one-time seminar of (ENV HL) Laboratory Safety Course and continuous compliance with hazardous waste and safety certification.
  - c. Fulfill a minimum of 18 dissertation credits.
  - d. Take at least three letter-graded 3-credit elective courses. It is understood that students will take electives throughout their degree to stay at the forefront of their field. It is expected that courses will be selected in collaboration with their advisor. Students are encouraged to take advanced (600-level) courses. Space will allow students to take courses based on personal educational needs, for example English and writing courses; appropriate undergraduate courses to fill deficiencies; essential courses for research (i.e. statistics and experimental design); and journal-review courses. Approved elective courses are 600-level (and some 500-level) courses in Mathematics, Statistics, Physics, Polymer Science, Mechanical Engineering, Chemistry, Biology, Computer Science, and Biochemistry. The Graduate Program Office has the current list of approved elective courses. This requirement is beyond the requirements of I.A.1.a.
  - e. Register as a full-time student (9 credits minimum, 16 credits maximum) in each semester until your final semester, when you and your advisor concur that you register on a program-fee basis. Program fee is when a student does not enroll for course/thesis/dissertation credits and is a candidate for a degree. The semester is considered "final" if your dissertation defense has been officially scheduled before the last day to add courses; only then may a student register for program fee.
  - f. Maintain a grade-point average of 3.0 or higher.
2. Qualify as a Ph.D. candidate by following the Qualifying Exam Procedure and by submitting a written dissertation prospectus ("thesis proposal"). The latter must be defended and approved by your Dissertation Committee 16 months after completing the qualifying exam procedure.
  - a. Qualifying Exam Procedure – Stage 1 - January Performance Review

Timing: Near January 15th of first year.

Objective: This element of the procedure is intended to ensure that the student achieve a minimum standard of proficiency in the graduate curriculum.

Qualification: A minimum grade of B in all four first semester courses and certification of satisfactory progress by faculty advisor.

Process: The progress of each first year student is reviewed by the faculty during a meeting held on or about January 15th.

Outcomes: Students would be allowed to continue in the program if performance is satisfactory. If performance is unsatisfactory students can be removed from the program or placed on probation for an additional semester.

b. Qualifying Exam Procedure - Stage 2 - May Performance Review

Timing: Near May 31st of the first year

Objective: This element of the procedure is intended to ensure that the students achieve a minimum standard of proficiency in the graduate curriculum and provide evidence of satisfactory progress in initiating their research.

Qualification: A minimum grade of B, a certification of satisfactory progress by faculty advisor and a satisfactory research progress document.

Research progress document: Each student will submit a document of 2500-3000 words describing their research and their progress up to that point (submission around May 15th).

Oral Presentation: Students will present their research progress to a faculty panel. Time will be permitted to allow for detailed questions from the panel.

Process: The progress of each first year student is reviewed by the faculty during a meeting held on or about May 31st.

Outcomes: Students would be allowed to continue in the program if performance is satisfactory. These students will each receive a memo informing them that they have completed the first part of the PhD. Qualification process. If performance is unsatisfactory students can be removed from the program or placed on probation for an additional semester.

Dissertation Committees: The Dissertation Committee for each student continuing in the program is to be appointed within 90 days after the conclusion of the Stage 2 review.

3. Submit a written dissertation and defend it orally. The dissertation and its oral defense must be found satisfactory by the Dissertation Committee and the Department Head.
4. Submit University and departmental copies of the thesis, satisfy all University requirements described in the Graduate School Bulletin, and pay all required fees and expenses. All requirements must be satisfied within the Statute of Limitations.

**B. Description of the Usual Ph.D. Process**

1. Upon beginning the graduate program, register for classes. Classes normally taken in the first semester are:

ChE 621 Thermodynamics I  
 ChE 625 Chemical Reactor Design  
 ChE 631 Fluid Mechanics  
 ChE 661 Advanced Analysis I  
 ChE 691 Departmental Seminar (invited speakers) - 1 credit, pass/fail  
 A one-time seminar of (ENV HL) Laboratory Safety Course and continuous compliance with hazardous waste and safety certifications

2. Early in the fall semester following initial registration in the graduate program, possible research topics are presented by the faculty. Based on this information and your individual discussions with the faculty, propose your preferences for thesis advisors. The Department will then assign your advisor. You then begin research and participation in your research group.
3. Pass the Ph.D. Qualifying Examination Procedure.
4. The final portion of the Qualifying Exam Procedure includes proposing a Dissertation Committee. The Dissertation Committee shall be composed of at least three members of the Graduate Faculty. Your advisor(s) shall be the Chair(s), at least two members must be from the Chemical Engineering Department, and at least one member must be from outside the department. Your Chair cannot serve as you Outside Committee Member. This committee is then appointed by the Dean of the Graduate School upon the department's recommendation.
5. Your courses in the second semester normally are:

1 ChE Elective: ChE633 Transport Processes (or) ChE622 Thermodynamics II  
 (or) ChE662 Advanced Analysis (or) any 600-level ChE course  
 A 3-credit elective course  
 ChE 691 Departmental Seminar (invited speakers) - 1 credit, pass/fail  
 ChE 791x Seminar (your research group) - 2 credits, pass/fail

6. In the second and third years, a typical schedule would be:

A possible elective course - 3 credits  
 ChE 691 Departmental Seminar (invited speakers) - 1 credit, pass/fail  
 ChE 791x Seminar (your research group) - 2 credit, pass/fail  
 ChE 899 Dissertation - 3 credits

You must register as a full-time student (nine or more credits) every semester. The exception is the final semester, when you and your advisor concur that you register and pay only a program fee. The semester is considered "final" if your dissertation defense has been officially scheduled before the last day to add courses; only then may you register for program fee.

At least three elective courses must be taken over the course of your degree. These courses must be taken on a graded basis. This requirement is beyond the requirements of I.A.1.a.

You must also fulfill a minimum of 18 dissertation credits during your entire period of study.

7. Following the successful completion of the Qualifying Exam Procedure, you prepare a written dissertation prospectus ("thesis proposal") describing the research planned for the dissertation. It formally constitutes the written part of the preliminary comprehensive examination.

This proposal outlines the proposed research topic, typically including:

- A brief statement of the problem and its relevance;
- Survey of the pertinent literature;
- Specific objectives or conclusions expected from the study;
- A plan of research to address the objectives with description of equipment, theoretical basis, operating approaches, methods of analysis, and safety considerations; and
- A plausible timetable.

The double-spaced, printed proposal must be of acceptable grammatical and stylistic quality. It should be brief but of sufficient length to cover the subject matter adequately, typically ten to fifteen pages of text.

This proposal must be submitted to, presented to, approved, and signed by all dissertation committee members. Then it is your responsibility to file the signed proposal with the Graduate School and a signed copy with the departmental office. This should be done preferably by 16 months after passing the qualifying exam procedure and at least seven months prior to the defense of your thesis. Three outcomes are possible, pass, fail, and fail with the option to retake. If students fail, their stipend fees will be discontinued. Advisors may opt out of the 16-month deadline. [Students who switch their advisors must submit their proposal no more than one year following the change.]

8. It is strongly recommended that you hold a dissertation committee meeting at least nine weeks before the date of your final examination. Prepare an oral presentation to give at this meeting, covering the essential data taken and analysis planned for final presentation in your thesis. When the dissertation committee is satisfied with the thesis content, proceed with writing a draft of your thesis.
9. Submit a final draft of your dissertation to your advisor and dissertation committee and an abstract of 600 words or less, suitable for publication. Follow the "Typing Guidelines for Master's Theses and Doctoral Dissertations," available from the Graduate School.
10. Your final oral examination ("dissertation defense") must be officially arranged at least one month prior to the defense date. Arrange with the departmental graduate secretary for an announcement of the date of the defense. One week before the final oral examination can be scheduled, send all members of the Dissertation Committee a copy of the dissertation.
11. At your defense, you first will make a public presentation of your dissertation. Following this presentation, the committee and any other members of the graduate faculty who wish to participate will examine you in closed session. This examination shall be primarily upon, but not limited to, your dissertation. Passing the defense requires unanimous approval by the committee.
12. Following satisfactory performance in your final oral examination, upload your electronic file to the UMI website (<http://www.etsdadmin.com/cgi-bin/school?siteid=78>) and submit two original signature pages on acid-free paper. Present one bound copy to your advisor

(and others as may be appropriate). Also, you must submit one bound copy on acid-free paper for the departmental office. Department copy must have original signatory page.

13. Submit to the Graduate School the "Certification of Eligibility for a Doctoral Degree." To complete this form, you must verify your status at the Graduate School Records Office.
14. Pay all fees and expenses.
15. Students are responsible for returning all departmental and university property in their possession before leaving campus, including books, equipment, and keys. Original laboratory notebooks and comparable original research documents must be returned to the advisor(s).
16. All of the requirements described above must be completed in accordance with a schedule available from the Graduate School in order to qualify for granting of the degree at the commencement each year. For example, the requirements must normally be completed by April 30 to qualify for the May commencement.

#### **C. Ph.D. Statute of Limitations**

The University sets a total time to earn the Ph.D. as six calendar years from acceptance into the program, or four years if the student already has a M.S. in the same field. Any extension is subject to the approval of the Dean of the Graduate School.

## II. MASTER OF SCIENCE (M.S.)

### A. M.S. Degree Requirements

1. Satisfactorily complete at least thirty graduate credits with the following stipulations:
  - a. At least 21 (including the thesis) of the 30 credits must be in Chemical Engineering.  
At least 13 of these credits must be earned in the 600 series of Chemical Engineering courses or above.  
At least six but no more than ten credits may be earned by means of the required thesis.
  - b. You must be registered as a full-time student (nine credits minimum, 16 credits maximum) and take at least one approved course each semester that you are in residence. The exception is the final semester, when you will not enroll for courses and will pay only a program fee.
  - c. Course credits used for fulfilling these degree requirements must be taken on a graded basis. The resulting grade-point average must be maintained at 3.0 or higher.
  - d. A maximum of six credits for graduate courses with grade B or higher may be transferred from other institutions.
2. In addition, pass the following coursework, taken on a pass/fail basis:
  - Two credits of research-group seminar (ChE 791x) in each semester after the first; and
  - One credit of departmental seminar (ChE 691) in each semester of residence;
  - A one-time seminar of (ENV HL) Laboratory Safety Course and continuous compliance with hazardous waste and safety certification
3. Within three months of being assigned your advisor, submit a one-page memo to the departmental Graduate Program describing your tentative thesis objectives and proposing a thesis Committee.
4. Submit a written thesis proposal acceptable to the department, as judged by the thesis committee following oral presentation of the proposal. The accepted proposal must be submitted to the Graduate Program Director no later than one year and one month after beginning graduate studies or within three months after switching from Ph.D. to M.S. studies. It must be submitted to the Graduate School no later than four months before the thesis defense.
5. Submit a written thesis and defend it orally. The thesis and its oral defense must be found satisfactory by the Thesis Committee and the Department Head.
6. Submit University and departmental copies of the thesis, satisfy any further University requirements, and pay all required fees and expenses. Original laboratory notebooks and comparable original research documents must be returned to the advisor(s). All requirements must be satisfied within the Statute of Limitations.

**B. Description of the Usual M.S. Process**

1. Within the first three months following initial registration in the graduate program, you will propose your preferences for thesis advisors. The Department will then assign your advisor(s).
2. Within three months of being assigned your advisor, submit a one-page memo to the departmental Graduate Program describing your tentative thesis objectives and proposing a thesis committee. With the assistance of your advisor, propose the thesis committee of three members of the Graduate Faculty. Your advisor(s) shall be the Chair(s). At least two members must be from the Chemical Engineering Department.
3. Prepare a written thesis proposal for formal presentation to the thesis committee. Your proposal must be submitted to, approved, and signed by all committee members. This should be done as soon as possible, preferably by the end of the second semester.

This proposal outlines the proposed research topic, typically including:

- A brief statement of the problem and its relevance;
- Survey of the pertinent literature;
- Specific objectives or conclusions expected from the study;
- A plan of research to address the objectives with description of equipment, operating or analytical approaches, and safety considerations; and
- A plausible timetable.

The double-spaced, printed proposal must be of acceptable grammatical and stylistic quality. It should be brief but of sufficient length to cover the subject matter adequately, typically ten to fifteen pages of text.

It is your responsibility to file the signed proposal with the department. A signed copy must also be filed with the departmental office. Presentation to the committee, approval, and filing shall be completed no later than one year and one month after beginning graduate studies (or within three months after switching from Ph.D. to M.S. studies) and at least four months prior to the defense of your thesis.

4. It is strongly recommended that you hold a committee meeting at least six weeks before the date of your final examination. Prepare an oral presentation to give at this meeting, covering the essential work planned for final presentation in your thesis. At the request of the thesis advisor, a brief written document may also be required. When the thesis committee is satisfied with the thesis content, proceed with preparing a draft of your thesis following the "Typing Guidelines for Master's Theses and Doctoral Dissertations," available from the Graduate School.
5. Submit a final draft of your thesis to your advisor and thesis committee at least three weeks before your final examination. Only then can the examination be scheduled by the department.
6. Complete and pass your final oral examination of your thesis. At your defense, you first will make a public presentation. Following this presentation, the committee will examine you in closed session. This examination shall be primarily upon, but not limited to, your thesis. Passing the defense requires unanimous approval by the committee.



7. File with the Graduate School the unbound original, one unbound copy (on acid-free paper), and the original abstract. Present one bound copy to your advisor (and others as may be appropriate). Also, you must submit one bound copy on acid-free paper for the departmental office. Original as well as both copies (Graduate School copy and Department copy) must have original signatory pages.
8. Submit to the Graduate School the "Certification of Eligibility for a Master's Degree." To complete this form, you must verify your status at the Graduate School Records Office.
9. Complete the Laboratory Checkout form and have it signed by your advisor and the Department Head.
10. Pay all fees and expenses.
11. Students are responsible for returning all departmental and university property in their possession before leaving campus, including books, equipment, and keys. Original laboratory notebooks and comparable original research documents must be returned to the advisor(s).
12. All of the requirements described above must be completed in accordance with a schedule available from the Graduate School in order to qualify for granting of the degree at the commencement each year. For example, the requirements normally must be completed by April 30 to qualify for the May commencement.

### **C. M.S. Statute of Limitations**

It is expected that M.S. students will complete their degree requirements within two years of matriculation. An extension of up to one additional year may be permitted if recommended by the thesis advisor and if the circumstances are deemed justifiable by the Graduate Program Director. Extensions beyond three years total will normally be denied.

### **III. GENERAL REGULATIONS**

#### **A. Research Assistantship Awards**

Each year the department will establish a standard research assistantship award, which will be identical to that offered to incoming graduate students and will apply to all full-time graduate students in the department. The award will be effective for the academic year September 1st through August 31<sup>st</sup>. At the beginning of each academic year, all graduate students will be notified in writing of the nature of this award.

Research assistantships in Chemical Engineering include stipend, health coverage, and tuition. Levels are reviewed annually. Specific amounts currently are the living-expenses stipend (paid bi-weekly over 52 weeks) and 95% individual health insurance coverage, which the department pays directly through the University. For research assistants with families, family health insurance coverage may be chosen instead. If so, the department pays 90% and the research assistant pays the balance.

All research assistantships are contingent upon satisfactory academic and research progress and upon the availability of funds. Students must not be employed outside their assistantship or the assistantship funding will be reduced accordingly.

The current stipend level and research assistantship package has been described to you in your letter of admission.

#### **B. Teaching Requirements**

Every graduate student beyond his/her first year shall be required, as part of the academic requirements, to devote an average of five hours per week to departmental teaching activities. Normal activities include grading homework, proctoring exams, and supervising laboratories. At present, these assignments are made for courses in, typically, four semesters during a doctoral program.

#### **C. TGPA Requirements for Full-Time Students**

Graduate students in Chemical Engineering must maintain an overall technical grade point average (TGPA) of 3.0 or higher. Courses to be counted in this average will be all undergraduate, as well as graduate technical courses (whether in Chemical Engineering or otherwise) taken at the University after admission to the Graduate School; it is not based on a selected group of courses. No grades are included for thesis, group seminar, or departmental seminar.

A first-semester student whose TGPA falls below 3.0 may continue for at least one more semester at the discretion of the Department, but without a University appointment. Such a student must achieve a cumulative TGPA of 3.0 or higher by the end of the second semester or they will be terminated. Students who bring their TGPA back up above a 3.0 are not guaranteed a renewed University appointment. A student who in any two semesters, consecutive or otherwise, has semester TGPA's below 2.8 is subject to academic dismissal.

#### D. Satisfactory Progress

As mentioned above, continuing graduate studies in Chemical Engineering require satisfactory progress toward your degree. It is easy to gauge progress in coursework and formal requirements as described. Most notably, the minimum requirements for satisfactory progress are maintaining at least 3.0 GPA and completing a thesis proposal on schedule.

The approved thesis proposal must be submitted to the department and the Graduate School preferably by 16 months after passing the qualifying exam procedure and at least seven months prior to the defense of your thesis for students intending to complete a Ph.D (or within three months after switching from Ph.D. to M.S. studies).

Evaluation of research progress requires the judgment of the thesis advisor(s) and committee. There are typically three committee meetings including a thesis proposal defense and the formal thesis defense. However, students and faculty are encouraged to arrange progress reviews, as necessary (*e.g.*, when important new results are available), if only to educate the committee. It is also the obligation of the advisor and the right of the student to arrange a prompt review when progress may be unsatisfactory.

If the advisor and committee decide that progress is unsatisfactory, they shall communicate the basis for judgment, possible remedies, and the date for a second review in writing to the student, the Department Head, and the Graduate Program Director. Normally, the second review should be held no less than 6 weeks for an M.S. candidate or 3 months for a Ph.D. candidate after the date on which written notice of the request for the first meeting was given to the graduate program director and department head. If progress is unsatisfactory after the second meeting, or if the student is not prepared for a second meeting by the specified date, financial support will cease until the student arranges a subsequent satisfactory review.

#### E. Graduate Employee Organization (GEO) Statement: Appointment and Reappointment Criteria and Procedures for Graduate Employees

It is the policy of the Chemical Engineering Department that all graduate students receive full stipends subject to: (i) satisfactory progress toward completion of the degree and (ii) availability of funds. Funding is made available via appointment as either a Research Assistant (R.A.) or Teaching Assistant (T.A.). The responsibilities of Chemical Engineering graduate students are the same whether they are in receipt of stipends as T.A.'s or R.A.'s. These responsibilities are:

- (i) Satisfactory progress towards completion of a graduate degree, including completion of course requirements and satisfactory progress in the thesis research project.
- (ii) Five hours per week of teaching duties for students beyond their first year of residence (acting as a teaching assistant in the department's courses at the undergraduate or graduate levels).

##### 1. Appointment as an R.A.

This appointment is made by the Graduate Program Director on the recommendation of the faculty member who is the principal investigator on the research grant from which the project is funded.

## 2. Appointment as a T.A.

Currently, these appointments are made by the Graduate Program Director in consultation with the faculty member who is the chair of the graduate student's thesis committee.

## 3. Assignment of teaching duties

Prior to the start of each semester, the Graduate Program Director provides each graduate student involved in teaching with a list of courses being offered for that semester. Each student then returns a list of preferred assignments. Assignment of graduate students to courses is then made by the Graduate Program Director. Where possible, these assignments will reflect the stated preferences of the graduate students. The specific teaching duties for a particular course will be established by the faculty member responsible for the course in consultation with the graduate students assigned to the course.

## 4. Initial appointments

Graduate students are assigned to research projects during the first semester of residence in the program. Where possible, these assignments are based on the stated preferences of the graduate students and are currently made by the Graduate Program Director in consultation with the Chemical Engineering faculty. Students have the opportunity of hearing presentations by the faculty about the available research projects and of meeting with the faculty to discuss these projects.

It is expected that graduate students will remain assigned to these projects until the completion of their degree. Requests for changes in assignment by a graduate student, which involve a change in the chairmanship of the thesis committee, can only be approved by the Department Head and the Graduate Program Director, in consultation with the faculty member currently serving as chair of the thesis committee.

## 5. Reappointments

Graduate students who are making satisfactory progress toward a degree can expect that their assistantships will be renewed, subject to the availability of funds, and every effort will be made to provide assistantships to those students over a normal period of residence. The normal period of residence for an M.S. student is intended to be less than 18 months and for a Ph.D. student 4 years. Funding for periods longer than these, while often possible, is subject to the approval of the Department Head and the chair of the thesis committee. It should be noted that Chemical Engineering graduate students are required to be in residence throughout the year, except for legal holidays and vacation periods (to be arranged in consultation with the chair of the thesis committee).

Teaching Assistantship appointments are normally made by the Graduate Program Director in early December and August for the Spring and Fall periods, respectively. Each graduate student in the program will receive notification from the Graduate Program Director by May 15 (for Summer and Fall appointments) or December 15 (for Spring appointments) of their reappointment for the following period. If by these dates the Graduate Program Director is unable to provide definite notification of funding, an estimate of whether funding is likely, possible, or unlikely will be given to the student concerned.

R.A.'s funded from research grants will receive notification from the Graduate Program Director six months prior to the expiration of these grants. This notification will include an estimate of whether the R.A. appointment will be continued, and from what source funding will be available. This notification will be updated sixty days and fourteen days prior to the expiration of the research grant, unless the Department Head has already given definite notice of renewed appointment by that time.