

# The Graduate Program in Chemistry Policies, Requirements and Guidelines

University of Massachusetts Amherst  
(current as of 2008)

## 1. Introduction

This document describes the requirements for the graduate programs in chemistry and other related Chemistry Department policies. These program requirements and policies have been formulated after wide consultation with all interested parties and agreed by vote at duly constituted faculty meetings. These requirements and policies are subject to change from time to time. When such changes occur, a new version of this document will be produced and changes which affect students currently in the program will be notified in writing by the Graduate Program Director (GPD). Written reminders of requirements and policies currently in place will also be issued periodically by the GPD. Relevant information is posted on the notice boards near the Chemistry main office. Students should consult these on a regular basis.

The Chemistry Graduate Program operates within the University's regulations as described in the *Graduate School Bulletin* and the *Graduate Student Handbook*. These publications are issued by the Graduate School and Graduate Dean's Office, respectively, and students are expected to be familiar with the relevant regulations. Some Department regulations are more restrictive than University regulations. When these regulations appear to be in conflict with the regulations of the Graduate School given in the *Graduate School Bulletin* or the *Graduate School Handbook*, the regulations of the Graduate School shall take precedence.

At the time of first registration, a member of the Graduate Program Committee (or designated alternate) is assigned as faculty adviser for each student. This assignment continues until the student is assigned a dissertation adviser. Thereafter, the dissertation adviser is the faculty adviser. Should the student change dissertation adviser, the new dissertation adviser becomes the faculty adviser for the student, and a new research program is begun. The Graduate Program Director is also available for consultation concerning any aspect of the program.

### 1.1 Programs Offered

Students may work towards the degrees of (a) Ph.D., (b) thesis M.S., (c) non-thesis M.S. The latter degree is normally awarded to students who are part way through studies leading to a Ph.D. The requirements for each degree are different, though it should be noted that the same academic standards are required for satisfactory completion of an M.S. degree as for a Ph.D. degree even though the requirements of the former are not so extensive.

### 1.2 General Philosophy of Program

The Chemistry Graduate Program, in common with other graduate programs, is designed to provide students with opportunities to acquire the knowledge and skills needed to embark on careers as independent scientists. Thus there are various features of the program which relate to oral and written communication skills, acquisition of advanced knowledge, laboratory techniques, teaching, research skills, professional working practices and so on. A major feature of the program is the production of a doctoral dissertation or master's thesis which satisfies the

university's criteria. The description of these, taken from the University's regulations, encompasses several of the skills described above.

"The dissertation [or thesis] in its completed form will be judged largely upon the ability of the candidate to review and make critical use of the literature; to formulate a problem, plan a method of attack and work systematically towards a solution; to summarize the material or data, and draw conclusions based thereon. Scholastic attainment in writing and presenting the results of the study will be crucial. The goal of the dissertation [or thesis] is to make a contribution to knowledge. It should be of publishable quality."

Many of the Departmental Requirements have been devised so that students can demonstrate that they are making satisfactory progress towards the production of a dissertation or thesis which will satisfy these criteria.

### 1.3 Progress towards completion of Studies

Both the University and the Department take the position that primary responsibility for continued progress to the successful completion of studies lies with the student. All students are expected to advance towards attainment of their degree as rapidly as possible consistent with maintaining excellence in scholarship. Students are expected to pursue research-related activities during the January intersession, the Spring break and the summer (June, July and August) as well as during the academic semesters. Progress is monitored by the GPD in consultation with the student's adviser and committee. Satisfactory progress includes (a) obtaining the specified minimum grades in required courses and maintaining the required grade point average, (b) completion of the various requirements of the program by the due deadlines (details of which are given in the following sections), and (c) maintenance of continued progress in research. Failure to make satisfactory progress may, depending on the circumstances, result in transferal from the Ph.D. to M.S. program or to termination of studies.

## **2. Financial Support and Conditions of Employment.**

Students are normally admitted to the Chemistry Graduate Program only if they have financial support as approved by the Department. For most students this support takes the form of an assistantship provided by the Department. Initially such assistantships are teaching assistantships, but later in the program students are typically supported on research assistantships provided by faculty research grants or contracts. Some students (usually international students) are supported by external sources, such as Government Scholarships, and some students are supported by assistantships from other University-based sources outside the Department. Students who have adjunct faculty dissertation advisers are not eligible for Departmental teaching assistantship and must be supported by their advisers. Provided that students maintain satisfactory progress in research and, if relevant, perform their required teaching duties satisfactorily, Department support is guaranteed over a five year period. This support comes from a variety of sources, including the various Departmental teaching accounts and the research grants of individual faculty. In the first year, a teaching assistant is required to maintain a minimum course load of 9 graduate credits each semester in order to retain Chemistry Department support.

Appointments as teaching assistant are limited to the first five years for Ph.D. candidates, or to the first two years for M.S. candidates. Appointments to a teaching assistantship will not be made beyond the current semester if (a) academic progress is unsatisfactory (failure to maintain a

3.0 average), or (b) teaching experience is unsatisfactory (as measured by the semester's end teaching evaluations) or (c) if a dissertation adviser from the Graduate Faculty of the Chemistry Department, or from the Chemistry Faculty Adjuncts, has not been appointed.

Interruption of a student's graduate study at the University of Massachusetts for at least two semesters for other than academic reasons will make it possible for the student to obtain one extra semester of Departmental support.

Appointments as a research assistant are normally funded by faculty grant support. The selection of appointees, terms of contract, and other details of such appointments fall entirely within the purview of the faculty member who is the principal investigator on the grant, subject to Departmental and University regulations.

Graduate students appointed as teaching assistant or research assistant may not, in general, accept concurrent employment elsewhere, except for modest tutoring commitments in accordance with Department guidelines (graduate students should not provide paid tutoring services for any student for whom they have responsibility for grading). Exceptions must be approved both by the GPD and the dissertation adviser prior to acceptance of any other type of employment. Concurrent employment is strongly discouraged by the Department, and students (especially international, but also U.S.) should note that there are University regulations governing the number of hours a student may work (calculated as the number of hours for the assistantship plus the number of credit hours – excluding dissertation or thesis credits).

Students appointed as teaching assistant or research assistant are governed by the conditions of the agreement between the University and the Graduate Employee Organization (GEO). TA appointments include the January intersession period. Details of public holidays, personal leave and vacation entitlement can be found in the Graduate Appointments Policies and Procedures document issued by the Graduate School. While the Department is flexible in setting working conditions, any proposed departure from the terms of the contract should be discussed with the student's supervisor well in advance.

Prior to conducting any work in a research laboratory, students must undergo safety training as prescribed by the Department's safety committee, and documentary evidence of the satisfactory completion of this training requirement must be filed with the GPD. This safety training includes the web-based training provided by the University's Environmental Health and Safety organization.

### **3. Residence and Enrollment Requirements**

Each Ph.D. candidate is required by University regulations to spend a minimum of one continuous academic year in full-time graduate work. This is defined as at least two consecutive semesters in which (a) at least nine credits are taken per semester in graduate courses (which may include doctoral dissertation) and (b) the student is physically present on the campus for some part of each week. Most chemistry students satisfy this requirement in the first year of their academic program.

Graduate students are required by University regulations to maintain continuous enrollment by registering for the appropriate course credits or by paying the Program Fee. A student who is not

properly enrolled will be withdrawn by the University at the end of the Late Registration Period. Reinstatement requires the approval of the GPD and the payment of a fee.

Students are considered to be “full time” if they are registered for nine or more credits and “part time” if they are registered for eight or fewer credits. For the purposes of loan deferments, students taking six to eight credits are considered to be “half time”. If required, the Department will certify that a student actively engaged in research or dissertation (or thesis) production is to be considered a full time (or half time) student regardless of the number of credits for which the student is registered.

#### **4. Length of Program**

Students should determine the date on which their “Statute of Limitations” (SOL) expires, as defined by the Graduate School. Briefly, M.S. candidates must complete all degree requirements within three calendar years measured from the date of first enrollment. Ph.D. candidates must complete all degree requirements within six calendar years measured from the date of first enrollment, or within four calendar years from first enrollment if admitted with a Master’s degree or equivalent. A student’s SOL may be extended by the Graduate Program Director by one year for Master’s candidates, or by either one or two years for doctoral candidates, acting in consultation with the student’s dissertation adviser. If a student wishes to apply for an extension, a written request should be submitted to the GPD containing details of the grounds for the request. This request should be supported by a separate letter from the student’s adviser. The only circumstances under which such a request will be routinely granted is for Ph.D. candidates who entered the program with a Master’s degree from another institution. The Department strongly discourages periods of study longer than 5-6 years (see “progress towards completion of studies” above).

#### **5. Course-work Requirements**

Breadth of educational experience is afforded by the requirement that each graduate student take the core course and one or two graduate level courses (numbered 500 or above) in each of the first two semesters. A minimum GPA of 3.0 is required to advance to the second year of the program. The situation of students who do not achieve this minimum will be reviewed by the Graduate Program Committee who will consider all the relevant circumstances and any documentation submitted by the student and adviser, and will recommend an appropriate course of action to the GPD.

Beginning in the second or third semester, and continuing for at least four semesters (two semesters for M.S. candidates), students will take at least one of the several Journal Club courses offered. The format of the course will vary by division and students will be informed of the detailed format by the faculty member responsible for the course. Participation will include at least one 25-minute seminar presentation.

Students are required to register for Chem 892 (research group) each semester. In exceptional circumstances, and only with specific permission of the dissertation adviser, this requirement may be waived. As noted earlier (section 3) students registered for less than 9 credits are considered part-time and thus the numbers of “full time” students in the program is not an

accurate reflection of the status of the program or of the faculty work-load involved. Registration in Chem 892 officially accounts for all active students.

Some divisions have additional course-work requirements and some have seminar presentation requirements. Students should consult with their division secretary and/or adviser for details.

Students are expected to discuss course-work with their advisers during each pre-registration period. Students are strongly encouraged to pre-register for graduate level courses, which are subject to cancellation if a minimum enrollment of 5 is not achieved.

For an M.S. degree, students are required to have 10 credits of Chem 699 (master's thesis). For a Ph.D. degree 18 credits of Chem 899 (doctoral dissertation) are required.

## **6. Selection of Dissertation or Thesis Adviser and Division**

Students are required to participate in a number of activities related to the choice of research area and the selection of a dissertation/thesis adviser. Potential advisers are all members of the graduate faculty in Chemistry and a small number of faculty from related departments who have adjunct faculty status (a list of these may be found in the Graduate School Bulletin). Students should bear in mind that faculty are not required to accept particular students as members of their research groups and may, for a variety of reasons, not take any students in a given year.

The required activities include rotations, faculty research seminar and interviews with faculty. Students are expected to have an open mind about possible choices of topic and adviser and to develop at least two viable options. Studies are terminated for a student for whom a faculty adviser has not been appointed by the end of the first year of the program.

### 6.1 Rotation Requirements

During the first semester, each graduate student rotates through a series of three different research groups of their choice. The format of these rotations is determined by the various faculty members involved, but may include attendance at a weekly research group meeting, visits with graduate students in the lab, one-on-one meetings with the faculty member, and some research-related activities. A fourth rotation is taken in the January intersession with a research group of the student's choice (and consent of the relevant faculty member), which may be a group with which previous meetings have occurred, or may not, according to the student's interest. It is also possible for students to spend rotation periods with adjunct faculty. Students should register for Chem 892 to obtain credit for satisfactory participation in the first semester rotations.

### 6.2 Faculty Research Seminar

During the first semester, faculty will present a series of seminars outlining aspects of their research. Attendance at these seminars is required and students will register for Chem 891F. Faculty may also present research related seminars on other occasions such as in the Departmental Seminar Program or at various research symposia held on campus. Students should regularly consult the notice boards near the Chemistry Office or the Department Web page for information on seminar presentations.

### 6.3 Faculty Interviews

During the first semester and January intersession, each incoming graduate student will consult with at least four faculty members concerning possible research projects. Faculty signatures are required on a form available from the GPD as evidence that these consultations have taken place.

### 6.4 Submission of Choices

For students entering the program in the fall, each student will submit to the GPD by February 1 a list of at least four faculty members, each of whom might serve as adviser, arranged in order of preference. In consultation with the Head of the Department, the GPD will determine the compatibility of the student's choice with Departmental support guidelines and will authorize compatible choices, normally by March 1.

### 6.5 Divisional Affiliation

Students are assigned to a division based on the consultations with faculty advisers during the orientation program prior to the start of the first semester. As there are divisional variations in program requirements, students are required to confirm their divisional, or interdivisional, affiliation at the time of submission of the choices for adviser. At this time students may change their divisional affiliation. A student may also follow a program which is a hybrid of two divisional programs. Consultation with the relevant faculty should take place as early as possible. Any such program must be approved by the GPD.

## **7. Dissertation/Thesis Committee**

The voting members of a Ph.D. dissertation committee consist of the dissertation adviser, two graduate faculty who are members of the Chemistry Department, and one member of the graduate faculty from another department, known as the outside member. If the dissertation adviser is from a Department other than Chemistry, the dissertation adviser is then also the outside member. Members are identified in discussions between the student and adviser. Typically, the student takes responsibility for informally approaching potential committee members. Once informal agreement to serve has been obtained, the adviser provides notification to the GPD, who in turn, recommends the appointments to the Graduate Dean. Other, non-voting members may be appointed. These could be research collaborators from another university, industry or government laboratory. The Graduate School discourages the appointment of other voting members, though this is possible under the appropriate circumstances. The dissertation adviser chairs all meetings of the dissertation committee except the Preliminary Comprehensive Examination, at which another member acts as temporary chair. At the Comprehensive Examination, the dissertation adviser is a speaking but not a voting participant in the proceedings.

The Ph.D. dissertation committee may meet as often as the chair deems necessary, but must meet (a) to examine the dissertation prospectus and original research proposal, (b) once per year to review research progress, the last meeting in this sequence shall normally be designated as the data defense meeting, and (c) to examine the dissertation. Normally the student, after consultation with the adviser, takes responsibility for the scheduling of the meetings.

The voting members of a master's thesis committee are the adviser and one other member of the Chemistry graduate faculty. The identification and appointment of thesis committee members is as described above for a dissertation committee. The committee may meet as often as the chair deems necessary, but must meet (a) to examine the thesis outline (b) once per year to review research progress, the last meeting in this sequence shall normally be designated as the data defense meeting, and (c) to examine the thesis. Normally the student, after consultation with the adviser, takes responsibility for the scheduling of the meetings.

## **8. Preliminary Comprehensive Requirement for Ph.D. Candidates**

The Graduate school requires doctoral students to pass a "preliminary comprehensive examination conducted by the major department". In the Chemistry program, this is a multi-part examination whose detailed format depends on the student's division. All students are required to prepare a dissertation prospectus and an original research proposal. Some Divisions require students to pass cumulative examinations, and some students are required to demonstrate satisfactory performance in designated advanced courses.

### 8.1 Cumulative Examinations and designated advanced courses

Students should consult their divisional secretary and adviser concerning any cumulative examination and/or designated advanced course requirements.

### 8.2 Dissertation Prospectus and Original Research Proposal

Before the end of classes in the fourth semester in residence, the student will schedule a meeting of the dissertation committee, and submit to the chair of the committee a Dissertation Prospectus. The Prospectus shall be at least 6 pages in length, not including supporting documentation (i.e., references, figures, tables and appendices). For these purposes, a page has 1-inch margins, is double-spaced and each line has 70 characters in a 12 point font.

Before the end of classes in the fifth semester in residence, the student will schedule a meeting of the dissertation committee, and submit to the chair of the committee an Original Research Proposal. The Original Research Proposal shall be at least 4 pages in length, not including supporting documentation (i.e., references, figures, tables and appendices). The dissertation committee will conduct an oral examination of the student in which the student's background knowledge and specific knowledge of the fields of research will be examined. The possible outcomes are Pass, Fail, M.S. Pass, or in exceptional cases, Conditional Pass (the examining committee will provide written details of the conditions to the student). The dissertation adviser can require the committee to give one and only one oral re-examination at the end of a 90-day period, measured from the date of the last class in the semester in which the examination was scheduled. The detailed format of the prospectus and the ORP may vary depending on the topic and the divisional preferences. Students should bear in mind the role of the committee in assessing whether the student will, if allowed to proceed, produce a dissertation in line with the graduate school's requirements given in section 1.1 above. The committee will be looking for evidence that the student is able "to review and make critical use of the literature; to formulate a problem, [and] plan a method of attack . . . to summarize the material or data, and draw conclusions based thereon." The documents are also an opportunity for the student to demonstrate written communication skills and the examination allows students to demonstrate their oral communication skills.

## 9. Research Progress

Before the end of classes in the sixth semester of the program and in each even numbered semester thereafter, the student will submit to the chair of the committee a Report on Progress in Research. The contents will be presented to the committee at a meeting to be scheduled before the end of classes. The chair of the committee will then submit a brief report to the GPD on the student's progress. Students whose research progress is unsatisfactory may be transferred to the M.S. program (and the SOL adjusted accordingly) or have their studies terminated.

When the student and the adviser agree that sufficient data have been amassed to justify a meeting of the committee for the purpose of defending the data, a Data Defense meeting is scheduled. This meeting may occur at any time in the academic year, but must occur at least three months before the presentation and final defense. The committee may suggest further work to be done; however, the committee normally approves the data for write-up subject to whatever constraints it wishes to impose.

The final meeting of the committee occurs when the student defends the completed dissertation or thesis. After the seminar presentation, the student meets separately with the committee and interested members of the graduate faculty, who then examine the candidate fully on the subject matter of the dissertation or thesis and such other topics as may seem relevant. When the student's performance is evaluated, only the committee members may vote. The result of this examination is reported in timely fashion to the Graduate Program Director, who then notifies the Graduate School.

### 9.1 Conference Presentations and Publications

The Chemistry Department expects that students will demonstrate progress in research by the submission of material for presentation at Regional, National or International Conferences as deemed appropriate in consultation with the adviser. It is also expected that by the time of the final defense of the dissertation or thesis manuscripts will have been submitted for publication in the primary refereed literature.

### 9.2 Production of Dissertation or Thesis

The dissertation or thesis must be produced in accordance with the University regulations. While there is some choice of layout, order of presentation of material, font size, format of tables and figures and so on, the University's regulations are rather restrictive. Students are strongly advised to familiarize themselves with the relevant regulations before investing time in the production of a dissertation or thesis. The Graduate School issues detailed written instructions and will read a specimen chapter and provide critical feedback on matters of format and production. The regulations change from time to time, so a previous dissertation or thesis may not be an accurate model. A copy should be prepared for each member of the dissertation committee in addition to the copies required by the Graduate School.

### 9.3 Required Notice of Final Doctoral Dissertation Defense

The Graduate School requires that timely public notice of the final oral examination and dissertation defense be given. The relevant information should be given to the GPD by the

dissertation chair several weeks prior to the proposed defense date. The defense may be scheduled at any time in the calendar year, but must be scheduled at least seven months after the dissertation prospectus (which has been accepted by the dissertation committee) is delivered to the graduate school.

## **10. Seminar Presentations**

The development of oral communication skills is considered important and students are provided with a number of opportunities to make oral presentations. Divisional requirements vary with regard to seminar presentations and students should consult with their adviser and divisional secretary.

### 10.1 Research Seminar, Journal Clubs and Research Groups

Some Divisions require one or more formal seminar presentations on topics not related directly to the student's dissertation research. Some journal club formats will require a formal presentation, other may involve a more informal discussion format. Some faculty research group meetings may involve presentation and discussion of research papers and/or research results.

### 10.2 Research Symposium

By the end of the fourth year, all students are expected to have presented at least one talk or poster at the annual Departmental Research Symposium.

### 10.3 Conference Presentations

Graduate students are expected to make contributions to scientific conferences, both by poster and oral presentation. For cases where faculty research funds are not available to help defray travel expenses, the Department and Graduate School offer some support for conference attendance. Students should consult with their adviser and/or the GPD in regard to application for travel funds.

### 10.4 Dissertation or Thesis Defense Seminar

As a part of the final defense of dissertation/thesis oral examination, students give a scheduled formal seminar, announced in the Campus Chronicle in the case of a doctoral dissertation (see section 9 above).

## **11. Termination of Studies, Satisfactory Progress, Safety**

Under the appropriate circumstances, the Department or Graduate School may terminate a student's studies. The General Regulations of the Graduate School require that a student must maintain an overall cumulative average of 2.8 in major courses and 3.0 in those courses which are submitted for the degree. A student who obtains a GPA of 2.8 or below in any two semesters (consecutive or otherwise) is subject to academic dismissal. The Department expects students in the first year to achieve a minimum of a 3.0 average in course-work as a pre-requisite for advancing to the second year of the program. Failure to complete a requirement by the due deadline (or a negotiated extension) or failure to maintain satisfactory progress in research may result in (a) transfer from the Ph.D. to the M.S. program with a change in statute of limitations or

(b) termination of studies. A student who is not accepted into a research group by the end of the first year of study will normally have their studies terminated.

In exceptional circumstances, the Department may judge that a student should not continue graduate study in the Chemistry Department for reasons of safety, even though satisfactory progress is otherwise evident.

## **12. Summary of Requirements for the Ph.D. Degree**

- 12.1 Successful completion of graduate level course-work in the major field consisting of the following,
  - the Core Course in each of the first two semesters,
  - up to four other graduate courses in the first year (may vary depending on divisional requirements),
  - faculty research seminar in the first semester,
  - at least four semesters of journal club,
  - research group meeting (Chem 892) each semester and
  - any divisional course-work requirements.
- 12.2 Divisional seminar presentations as required and delivery of either an oral or poster presentation at Research Symposium by the end of the fourth year.
- 12.3 At least 18 credits of Chem 899 (Ph.D. Dissertation)
- 12.4 Dissertation Prospectus (see section 8.2)
- 12.5 Original Research Proposal (see section 8.2)
- 12.6 Preliminary Comprehensive Requirement (see section 8)
- 12.7 Annual research progress reports (see section 9).
- 12.8 Data defense (see section 9).
- 12.9 Dissertation (see section 9.2)
- 12.10 The passing of a defense of dissertation examination (see section 9).
- 12.11 The satisfactory completion of the University residence requirement (see section 3).
- 12.12 Payment of all fees and expenses, together with deposition of the signed dissertation (original plus one copy) with the Graduate School.
- 12.13 Completion of all other Graduate School requirements.

## **13. Requirements for the Thesis Master's Degree**

Students are normally admitted to the Chemistry Graduate Program on the basis of pursuing studies leading to the award of the degree of Ph.D. However with the agreement of the GPD and (if relevant) the student's adviser, a student may pursue studies leading to the award of M.S. degree by research. The Chemistry requirements are in line with those of the Graduate School and students are advised to study carefully the relevant paragraphs in the Graduate School Bulletin. The requirements for the master's degree by thesis research are as follows. The same

standards are used to evaluate satisfactory performance in the M.S. degree program as in the Ph.D. program.

13.1 Ten credits of Chem 699 (Masters Thesis)

13.2 Course-work in Chemistry totaling at least 21 credits made up from

- The Core Course in each of the first two semesters.
- Faculty research seminar in the first semester
- At least two semesters of journal club.
- Research group meeting (Chem 892) each semester.
- Any divisional course-work requirements.
- Electives chosen in consultation with the adviser

At least 15 of these 21 credits must be taken on a letter graded basis and these must include at least six credits earned in the 600 - 800 series (not counting journal clubs, seminars or group meeting). The letter-graded courses submitted for the degree must have a GPA of 3.0 or better.

13.3 Thesis Outline

A written Thesis Outline is presented and defended orally before the thesis committee. This requirement must be completed and the outline received by the graduate school at least four months before the defense of thesis final oral examination.

13.4 Final seminar and defense

Presentation of an acceptable thesis and satisfactory performance in the defense of thesis final oral examination. The examination consists of a seminar presentation followed by a oral examination by members of the thesis committee.

13.5 Payment of all fees and expenses.

13.6 Completion of all Graduate School requirements.

## **14. Non-Thesis M.S. degree**

Under exceptional circumstances a student may petition to be permitted to submit for a terminal non-thesis Master's degree. The requirements are as set out in the Graduate School Bulletin and will include, among other requirements, the passage of a general examination. The form of this examination will be decided on a case by case basis.

## **15. Non-Thesis M.S. degree for Ph.D. candidates**

Students who have completed the comprehensive examination requirement (see section 8 above) and who have 30 credits that accord with University requirements may submit for an M.S. degree. These requirements are 21 credits in the major field, at least 12 credits in 600-800 level courses, at least 15 credits on a letter-graded basis, and a GPA of 3.0 or better on those letter-graded courses submitted for the degree.

## **16. Exceptions to the Requirements**

When there is good cause, the Graduate Program Director will consider requests for exceptions to these regulations. Such requests must be made in writing and, where relevant, accompanied by a supporting memo from the student's adviser.