

Thesis MS Roadmap – Spring 2020

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Chemistry Administrative Assistant: Veronica Garcia

Chemistry Department Chair: Joshua Pak

Chemistry Graduate Program Committee (GPC): Andy Holland, John Kalivas, Kavita Sharma

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Graduate Degrees in the Department of Chemistry

The Chemistry department offers three different graduate programs, each intended to serve a different type of student. Although these degrees all include the letters “MS” and all require 30 credits of graduate coursework including 15 6600-level credits focused in chemistry, each carries a unique set of privileges and expectations, and students should not expect to freely switch between them after starting one program. In particular, BS/MS students will be asked to reapply to the graduate school if they wish to move to either standalone MS program.

The **Thesis MS** is a two-year research-centered degree. While it requires significant coursework, this program emphasizes year-round laboratory research, including one summer, and culminates in the writing of an original thesis. At the close of the program, each student presents and defends their thesis. Thesis MS students are fully eligible to receive research or teaching assistantships to help compensate them for the program’s substantial time commitments.

The **Non-Thesis MS** is a two-year coursework-centered degree. This track requires a significantly larger number of traditional courses, and only 4 credits of research (and no thesis credits) may be counted towards its requirements. The program concludes with written and oral exams on selected coursework subjects. While Non-Thesis MS students may choose to take on teaching assignments on a course-by-course basis, they are less likely than Thesis MS students to receive full-time teaching assistantships.

The **BS/MS** is an accelerated three-year program enabling undergraduate students to earn MS degrees in one additional year beyond the undergraduate degree by pursuing full-time summer research for two summers and beginning MS coursework before completing their undergraduate degrees. This program is intended for ambitious students seeking to deepen their engagement with chemistry as undergraduates, and to quickly burnish their credentials for applying to jobs or competitive PhD programs. The program concludes with the composition and defense of a research paper similar to a thesis. BS/MS students are fully eligible, like Thesis MS students, to receive research and teaching assistantships during all three years of the program.

Funding

A limited number of teaching assistantships, which award a full tuition waiver and stipend to students fulfilling three teaching assignments each semester, are awarded for the following year each April. To apply for consideration, a student should submit a brief personal statement, their transcript, and letters of reference ideally from current teaching and research supervisors. Research assistantships may also be available by arrangement with individual faculty.

Department-funded MS students must obtain permission from the GPC to maintain a non-university job during the first semester in the program. Thereafter, permission must be obtained from a student’s research committee. Additional employment by the University also requires permission from the Dean of the Graduate School.

Introduction to the Thesis MS Candidate Road Map

This document outlines the procedural steps required for successful completion of a Thesis MS degree in chemistry. The road map also describes your obligations in the MS program and departmental expectations of your performance. It is your responsibility to ensure that you are meeting all deadlines as you progress through the program. A checklist of deadlines is provided on page 12 of this document.

Please note that this is an advisory document that is meant to assist your planning, rather than to define official university policy. For the authoritative version of all official policy definitions please see the ISU Graduate Catalog.

The following is a brief overview of the steps required to earn your degree.

Year One:

Fall Plan an initial program of study to satisfy course requirements, satisfy any remaining undergraduate prerequisites and/or GRE requirements, choose a research advisor and research committee, and write a research project overview and research contract.

Spring Begin research project, and give a literature seminar in CHEM 6601.

Summer Continue research project full time for at least 10 weeks, and write a first-year research report.

Year Two:

Fall Submit the Final Program of Study to the Graduate School, and apply for graduation with an MS degree.

Spring Write your thesis, enrolling in CHEM 6650 for at least 6 credits. [Schedule an oral exam](#) for at least three weeks prior to graduation, and notify the Graduate School at least two weeks in advance of the exam. Provide your research committee members with an essentially complete thesis at least two weeks before the exam, present your research in CHEM 6601, and defend your thesis.

Performance Expectations

You are required to maintain *good academic standing* in the MS program. This is accomplished by meeting Departmental, University, and Graduate School requirements as outlined below and in the Graduate Catalog, and by fulfilling the research contract you devise with your advisor. Specifically, the requirements for good standing include but are not limited to:

- Maintaining a minimum **overall** graduate GPA of 3.0
- Receiving no more than two grades below B– in graduate courses
- Progressing on your research project each and every semester
- Submitting required paperwork in a timely manner
- Meeting all responsibilities outlined in your research contract and/or teaching assignment
- Attending department seminars and local symposia when possible

Failure to maintain good standing could result in dismissal from the MS program or revocation of departmental funding. These consequences are decided by the Chemistry Department Chair upon recommendation from the Graduate Programs Committee (GPC). If you are receiving funding, that funding is typically guaranteed only upon satisfactory progress and good standing, and only for the term initially indicated (usually one or two years). A degree will be awarded after that time only if satisfactory research and coursework has been completed. Continuation of funding after that time will be subject to the approval of the GPC.

You are expected to attend all seminars sponsored by the Chemistry Department whether or not you are enrolled in the seminar course. Chemistry seminars are generally held on Friday afternoons at 1:00 PM. If you have unavoidable course or teaching assignment conflicts, you are excused.

Department-funded MS students are given various teaching assignments which typically include supervising laboratory sections and providing grading assistance. You are expected to meet all obligations of your assigned duties, including:

- Be present, punctual, and prepared at all meetings scheduled by your teaching supervisor.
- Complete grading on the schedule set by your supervisor.
- Deliver laboratory instruction and complete grading according to the standards set by your supervisor, prioritizing student safety and learning.
- Be professional and respectful in all interactions with students.

Department-funded MS students must obtain permission from the GPC in order to maintain a non-university job during the first semester in the program. Thereafter, permission must be obtained from your respective research committee. Additional employment by the University also requires permission from the Dean of the Graduate School.

Getting Started

1. If you are funded by the department, you must pick up a check for tuition and fees at registration during each fall, spring, and summer session. This check must then be signed and turned in at registration. **Failure to do so will result in late fees payable by you.** In order to receive payment of your stipend, you must go to the personnel office in the Administration Building and fill out a few forms when you arrive on campus for the start of the fall semester. You may contact the chemistry administrative assistant for details.
2. If you have teaching responsibilities, be sure to contact the instructor to whom you are assigned, and to make fulfillment of these responsibilities your highest priority. If you are funded by a research assistantship, you should already be establishing formal research responsibilities with your advisor.
3. If you have not already selected a research project, make appointments with faculty to discuss their research interests. Come to an agreement with one faculty member with whom you will do research, and who will serve as your **advisor** for the course of your degree program and as the chair of your graduate committee. You should do this as quickly as possible so that you can begin your research project.
4. With the aid of your advisor, devise an **initial program of study** that satisfies the requirements below and your advisory committee. This program should include prompt fulfillment of any preconditions on your admission, such as completion of pre-requisite courses or satisfactory performance on the GRE.
5. You must form a **research committee** consisting of your advisor and two other members. One of the members should ideally be from another discipline within the chemistry department (analytical, inorganic, organic, physical, or biochem). The third member must be from another department and will act as your Graduate Faculty Representative, or GFR. The GFR may be involved in your research as a collaborator, but it is important that at least one member of your committee be sufficiently independent and disinterested in your research that you trust them to mediate any conflicts that arise with your advisor(s). After you have formed your research committee, please fill out the Research Committee Form, collect the signatures indicated (the Department Chair should sign last) and return it to the GPC by **November 1**. If you have no preference for a specific GFR, the role can be assigned later.
6. Write an **overview of your research project** briefly introducing its subject, and defining the specific objectives you intend to achieve in completing your degree. At the same time, you and your advisor should compose a **research contract** outlining your research responsibilities (hours in the lab, lab upkeep duties) and any research progress benchmarks you are expected to meet (document drafts, research presentations). Each document should be signed by your research committee and submitted to your advisor by **December 1**

Courses Required for Admission to the MS Program

You are expected to have completed the following courses before beginning the MS program. If you are missing any of them, you should discuss this with the chemistry department chair or your research advisor as soon as possible, and plan to complete them as early as possible in your program.

CHEM 1111,1112	General Chemistry I and II	9 cr
CHEM 2211,2213	Inorganic Chemistry I and Lab	4 cr
CHEM 2232,2234	Quantitative Analysis and Lab	4 cr
CHEM 3301,3302	Organic Chemistry I and II	6 cr
CHEM 3303,3304	Organic Chemistry Laboratory I and II	2 cr
CHEM 3351,3352	Physical Chemistry	6 cr
MATH 1170	Calculus I	4 cr
MATH 1175	Calculus II	4 cr
PHYS 2211,2212	Engineering Physics I and II	8 cr
PHYS 2213,2214	Engineering Physics I and II Laboratory	2 cr

If you have been granted conditional admittance without yet fulfilling the Graduate School's GRE and/or TOEFL requirements, you must achieve the required test scores or otherwise meet your conditions prior to filing for graduation, and should seek to do so as soon as possible after you begin the program.

Requirements for Completion of the MS Program

The core curriculum of the typical program is composed of research and the four graduate level advanced chemistry courses (CHEM 6609, CHEM 6630, CHEM 6655, and CHEM 6671). Note that only one of these courses is offered each semester, so you will only have one opportunity to take each class in a two-year schedule. Additionally, some of these courses have prerequisites in addition to the admission requirements listed above, which must be completed but might not themselves count toward graduate elective requirements – consider this when planning your schedule. At least one of the core courses is required, and all four are recommended. The balance of coursework requirements comprises seminar (CHEM 6601) and graduate electives in chemistry or in related disciplines specific to a student's focus of study.

The degree requires credits for thesis writing (CHEM 6650), and terminates in a thesis presentation and defense. Students may also count up to 12 credits of research, CHEM 6635, toward their degree requirements.

A minimum of 30 graduate credits is required for all degree options, although a larger number of credits (9 graduate credits during Fall and Spring semesters) will be required to maintain full-time standing. Summer enrollment is also required in order to complete the research expectations of the thesis degree and meet the institutional continuous registration requirement for graduate students.

Note that although these are the official minimum requirements, every program of study must be specifically approved by your advisory committee and signed by the Department Chair.

Typically, thesis students are expected to complete at least five total lecture courses.

1 of CHEM 6609	3 cr	
CHEM 6630		
CHEM 6655		
CHEM 6671		
CHEM 6601	2 cr	
CHEM 6650	6 cr	<i>≤ 4 more cr count as electives</i>
66XX Lecture Electives*	6 cr	
55XX/66XX Electives*	13 cr	<i>may include ≤ 12 cr CHEM 6635</i>

*Graduate Electives may be courses in CHEM or related disciplines, typically in the College of Science and Engineering or the College of Pharmacy. These classes should be selected in consultation with your advisor and must be approved by your advisory committee.

Recommended Schedule for Thesis Degree

The following schedule of coursework is recommended for students intending to maintain full-time status, although some courses may be replaced by graduate electives. Be sure to consult with your advisor if you wish to deviate from the courses outlined below. The sequence of advanced chemistry courses CHEM 6609, 6630, 6655, and 6671 will vary depending on the year you enroll.

First Year Fall

CHEM 6630	Advanced Analytical Chemistry	3 cr
XXXX XXXX	Graduate Coursework Elective	3 cr
XXXX XXXX	Grad Elective / Prereq Completion	3 cr

First Year Spring

CHEM 6655	Advanced Physical Chemistry	3 cr
CHEM 6635	Master's Research	2 cr
CHEM 6601	Seminar (Literature Presentation)	1 cr
XXXX XXXX	Graduate Coursework Elective	3 cr

Summer

CHEM 6635	Master's Research	1-6 cr
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Second Year Fall

CHEM 6671	Advanced Organic Chemistry	3 cr
CHEM 6635	Master's Research	4 cr
CHEM 6650	Thesis	2 cr

Second Year Spring

CHEM 6601	Seminar (Research Presentation)	1 cr
CHEM 6609	Advanced Inorganic Chemistry	3 cr
CHEM 6650	Thesis	5 cr

TOTAL: 37-42 cr

Year One of the Thesis MS Program

You are strongly encouraged, upon entering the program, to design with an advisor a **detailed program of study** specifying when you will complete the required coursework. Course requirements are listed above. At least 30 graduate credits are required, including at least 15 6600-level CHEM credits. Because some courses are offered only once every two years, and you may need to first complete prerequisites, it is important to begin the required coursework immediately. To fill out a full-time schedule you are encouraged to take one or two courses outside the department, although research activities may also fill these credits. Keep in mind that your curriculum must be approved by your advisory committee and signed by the Department Chair, and you should not register for excessive research credits without prior approval.

By November 1st, you must select a research committee of three members:

Research Committee: **Chair (Research Advisor)** – supervises your research on a day-to-day basis and serves as your primary academic advisor.

Chemistry Representative – Chemistry faculty ideally from outside your discipline (organic, inorganic, analytical, physical, biological).

Graduate Faculty Representative (GFR) – faculty member from outside the department. The GFR is the Graduate School's representative and is responsible for ensuring fairness, and potentially an outside arbiter if you have a dispute with your advisor.

The research committee will endorse your satisfactory completion of various requirements in the degree program, and ultimately serves as your examination committee when you defend your thesis at the end of your final semester. The research advisor should be selected with care, as changing advisors later in the program may interrupt research progress and delay graduation. Other committee members may be replaced as scheduling dictates. All three members must be members of the graduate faculty, who are listed in the Graduate Catalog.

As early as possible in your first semester, you should devise an initial program of study that meets the course requirements previously described. This must be approved by your advisory committee by the end of your first semester.

By the end of the fall semester, you must write a brief **research overview** that describes your research project in one or two pages. Your overview should include an introduction, the significance of the research, a description of the experimental work, a list of materials required, and an outline of your specific objectives. The research overview must be approved by your research committee by December 1 of your first semester.

In consultation with your advisor, draw up a **research contract** that outlines your responsibilities in the lab and the benchmarks that will define satisfactory progress in your research program. This will typically include discussion of the time you are expected to spend on research, and may

also detail your responsibilities in terms of laboratory upkeep. Research benchmarks may take the form of formal presentations of your work, completion of draft documents, or other periodic progress reports formal or informal. This document should also be approved by your committee and filed with your advisor.

By April 1st you may apply to receive departmental funding for the following year by submitting to the Chemistry Department a brief personal statement, grades, and letters of reference from your research and teaching supervisors. Unless your original offer of funding specifically exempts you from applying for its renewal, you should plan to submit these materials. Previously unfunded students are also considered in this process.

The first seminar you present in CHEM 6601, typically in your first Spring semester, should not be on a topic directly involved with your thesis. Instead, the seminar should be on a research topic from the literature that you find interesting.

During the spring and summer, you are expected to work vigorously on your research project. You should spend at least 10 weeks of the summer doing research on a full time basis, enrolling in 1-6 credits of Master's Research (CHEM 6635) with your research advisor as the instructor for the course. By the end of the summer you should write a report describing your research progress to date, and submit it to all members of your graduate committee. Specific requirements regarding the extent of this report may be part of your research contract.

Year Two of the Thesis MS Program

You should complete your research project during the second year of the MS program, enrolling in additional credits of CHEM 6635 in the fall. In the spring, you should enroll in CHEM 6650 for at least 6 credits.

You must submit your **Final Program of Study** to the Graduate School for evaluation in the Fall semester. The Graduate School examines your Final Program of Study and you will be informed of any deficiencies that you then need to rectify in the spring semester. Note that you cannot notify the Graduate School of your oral examination date until your Final Program of Study has been approved by the Graduate School.

During your penultimate semester you should also apply to the graduate school for **graduation with an MS degree**. If you do not apply for graduation at this time, you must then do so within the first two weeks of the semester you plan to graduate. If you do not complete all the requirements for the MS program by the end of the semester you planned to graduate, you will have to reapply for graduation.

During your final semester, you must complete a **thesis** and orally defend it to your research committee. It is suggested that you follow the thesis order as described in the "Instructions for Preparing Theses, Dissertations, DA Papers, and Professional Projects" booklet available at the Graduate School when preparing your thesis. Your research committee must endorse your thesis as meeting these expectations and being in essentially final form two weeks before the scheduled defense, which in turn must be scheduled three weeks before graduation (putting the deadline for

your thesis near the start of April, at the latest). If your examination committee does not find your thesis to be adequate, you will not be allowed to proceed with the oral examination.

For logistical reasons, the Graduate School must be informed of your **oral examination date** at least two weeks before the examination occurs. This is accomplished by sending to the Graduate School the notification form contained in this booklet. You should also be sure to remind your committee members of the date. Please note that you cannot notify the Graduate School of your oral examination date until your Final Program of Study has been approved by the Graduate School. It is imperative that you work closely with your advisor for successful [scheduling of your oral examination](#).

The **oral examination** will typically begin with your CHEM 6601 research seminar open to the general public, and proceed with a brief public question and answer session. At this point the general public will be dismissed, and your examination committee will question you on your research and related topics from prior chemistry courses. If you fail your oral examination, a second exam may be scheduled by your committee no earlier than four weeks after the first oral exam. (This restriction may be waived by the GPC.) The GFR will help verify that this process proceeds fairly and that your thesis and exam performance meet university standards, and will report any irregularities to the Graduate School.

Before you depart with your MS degree, you must submit a copy of your finalized thesis to the Chemistry Department for our records. This copy need not be printed, as the Chemistry Department will handle archiving according to current standards. You must also clean up your work area, properly dispose of all waste, and complete the **Checkout Approval** form.

MS Checklist

<u>PRIOR TO ADMISSION</u>	SUBMIT TO:	DATE DUE	DATE COMPLETE
Complete all CHEM, MATH, and PHYS prerequisites	(NA)	before admission, or ASAP	
If necessary according to graduate school policy, report satisfactory GRE and/or TOEFL Scores	Chemistry Department	before admission, or ASAP	

<u>YEAR 1</u>	SUBMIT TO:	DATE DUE	DATE COMPLETE
MS Research Committee Form	GPC	November 1	
Approval of Research Overview Form & Research Contract	Advisor	December 1	
Initial Program of Study Form	Advisor	end of Fall	
Submission of Year 1 Research Report	Advisor	end of Summer	

<u>YEAR 2</u>	SUBMIT TO:	DATE DUE	DATE COMPLETE
Final Program of Study Form	Graduate School	end of Fall semester	
Application for Graduation with MS Degree	Graduate School	first two weeks of Spring semester	
Completed Approval of Thesis Form	Advisor and Research Cmte.	two weeks before oral exam date	
Schedule Oral Examination (https://isu.co1.qualtrics.com/jfe/form/SV_3R6Vw16M4Rb1MAR)	Graduate School	two weeks before oral exam date	
Oral Examination	(NA)	three weeks before graduation date	
Final Approval of Thesis	Advisor	before graduation	
Submit a copy of Thesis	Chem. Admin Assistant	upon graduation	
Checkout Approval Form	Chem. Admin. Assistant	upon graduation	

MS RESEARCH COMMITTEE FORM

MS Candidate _____
Name Signature Date

Major Research
Advisor _____
Name

Signature Date

Chemistry Faculty
Member _____
Name

Signature Date

Graduate
Faculty
Representative _____
Name

Department

Signature Date

Department Chair _____
Name

Signature Date

- Approved
- Disapproved

Submit to the GPC by November 1.

Sample Research Contract

Research Contract

As a research collaborator in the laboratory of (Professor) you will be required to complete an original research project that will serve as the research component for you MS degree. The MS degree is a research intensive and will require an extensive time commitment for completing your research component. In order for the research to progress you will be required a minimum of () hours per week during the academic year and () hours per week for () weeks during the summer. In addition to conducting research you will also have the following responsibilities in maintaining the research laboratory:

X

MS Advisor

X

MS Candidate

(Submit actual contract to your research advisor by December 1.)

APPROVAL OF THESIS OVERVIEW & RESEARCH CONTRACT

The undersigned, which compose the MS candidate's research committee, find the submitted research overview and research contract to be satisfactory.

MS Candidate _____
Name

Major Research
Advisor _____
Name

Signature _____ Date

Chemistry Faculty
Member _____
Name

Signature _____ Date

Graduate
Faculty
Representative _____
Name

Signature _____ Date

Comments _____

Submit to your research advisor by December 1.

APPROVAL OF THESIS

The undersigned, which compose the MS candidate's research committee, find the submitted research paper to be of a substantive nature and the oral examination may proceed.

MS Candidate _____
Name

Title of Thesis _____

Major Research
Advisor _____
Name

Signature

Date

Chemistry Faculty
Member _____
Name

Signature

Date

Graduate
Faculty
Representative _____
Name

Signature

Date

Submit to your research advisor 2 weeks before your oral exam.

CHECKOUT APPROVAL

The undersigned, which comprise the MS candidate, research advisor, and the Laboratory Materials Supervisor, find the MS candidate's research work area to be satisfactorily clean. The undersigned also agree that all chemicals and other items of a hazardous nature resulting from the MS candidate's research have been disposed of properly.

MS Candidate

Name

Signature

Date

Major Research
Advisor

Name

Signature

Date

Laboratory
Materials
Supervisor

Name

Signature

Date

Submit to the Chemistry department administrative assistant before leaving the department.