DEPARTMENTAL GUIDELINES FOR GRADUATE STUDIES
DEPARTMENT OF CHEMISTRY
EBERL Y COLLEGE OF ARTS AND SCIENCES
WEST VIRGINIA UNIVERSITY

Modified per faculty vote November 4, 2019

INTRODUCTION

The Department of Chemistry offers programs leading to the M.S. and Ph.D. degrees in several areas of chemistry, currently including Analytical, Inorganic, Organic, and Physical. The specialties within these areas can be found in the departmental brochure or website which lists the members of the chemistry faculty and describes their specific research interests.

A. Comparison of the M.S. and Ph.D. Programs

The major emphasis of the Ph.D. program is on research. Students are expected to take advanced coursework that will provide the foundation for their research. A typical research problem may take several years to complete and involves many advanced techniques and concepts at the frontiers of chemical knowledge. The Ph.D. program culminates in the preparation and defense of the Ph.D. dissertation. In order to ensure that students are well versed in the advanced concepts of chemistry related to their discipline, a series of examinations must be satisfactorily completed during the course of study.

The M.S. program is limited in scope and has two tracks: a thesis track and a coursework track. The thesis track involves advanced coursework and a study of a problem in chemical research culminating in the preparation and oral defense of a M.S. thesis. The coursework track involves only advanced coursework.

B. Committee Structure

1. *The Graduate Advising Committee (GAC)*

This committee, which is synonymous with the departmental Graduate Studies Committee, will monitor the graduate student's progress to ensure uniform interpretation and enforcement of Departmental and University requirements regarding coursework and examinations. At the beginning of a student's graduate career, this committee will set up an initial coursework program that meets departmental requirements and that addresses any deficiencies that may have been evident from the results of the Guidance Examinations (see later). This committee will advise all M.S. students in the coursework track.

2. *The Graduate Research Committee (GRC)*

As soon as the graduate student has selected their research topic and research advisor, a Graduate Research Committee (GRC) for the student will be constituted. For the M.S. degree (thesis track only), this committee will consist of at least three faculty members; for the Ph.D. degree, this committee will consist of at least five faculty members: four graduate faculty members from within the Chemistry department and one being from outside the Department of Chemistry. The student's research advisor will serve as the chairman of this committee. The responsibilities of this committee will be to make sure that the student completes the prescribed coursework program, to administer the candidacy exam, to read and evaluate the quality of the thesis or dissertation, and to administer the final oral defense of the research thesis or dissertation. Once a student successfully passes the Candidacy Exam, they must meet annually with their GRC to keep them appraised of current progress in research and toward completing the M.S. or Ph.D.

C. Selection of a Research Problem and a Research Advisor

In order for a student to select an appropriate research problem and research advisor, it is necessary to become familiar with the various research activities available within the Department. For this reason, meetings should be arranged by each student to meet individually with faculty members to discuss research opportunities. After these meetings with the faculty are completed, the student is free to select the particular research problem that is of greatest interest. A special form will be utilized to ensure that these meetings are held and the student has been made aware of all options. The research advisor selected for the student must sign the form acknowledging their acceptance of the student. A research advisor will be chosen by the end of the first semester in residence. Once an advisor is officially chosen, the student will work with the advisor to form the student’s GRC and create a Plan of Study. The Plan of Study must be submitted to the department before the end of the second semester in residence.

D. Course Identification

Courses numbered at the 100-400-level are undergraduate courses. When taken by graduate students, these courses do not count toward their degree requirements. Courses at the 500- through 700-level are graduate courses. Titles and descriptions of courses may be found in the University Graduate Catalog. Special Topics and Advanced Topics courses not listed in the University Graduate Catalog may also be offered and are typically announced a semester before the planned offering.

E. Teaching Assistant Requirement

All international students whose native language is not English must be certified as being

competent in English to be a laboratory teaching assistant. All new international students must take the exam used to certify competency during the week prior to the start of their first semester. Students who do not pass the exam must register for the appropriate English as a Second Language course. A passing score on the exam must be obtained by the end of the second semester in residence. Students who fail to receive a passing score on the exam by the end of their second semester in residence will not receive further departmental teaching assistant support until they obtain a passing score.

New international graduate students who have passed the exam will be eligible to serve as laboratory teaching assistants with a full-time teaching load. Members of the chemistry faculty designated by the chair will interview new graduate students who do not pass the exam on their initial attempt. Based on the interview, a reduced laboratory teaching load may be assigned, with other duties such as grading making up the remainder of the assigned teaching load. New students whose language proficiency is deemed to be insufficient will not be eligible to serve as laboratory teaching assistants.

All laboratory teaching assistants will be supervised and evaluated by course instructors. Laboratory teaching assistants are required to attend regularly scheduled lab training sessions. An unsatisfactory performance as a laboratory teaching assistant may result in removal of a teaching assistantship.

F. Petition

It is recognized that special situations arise that are not covered by these program descriptions. A student who desires a modification in their program has the right to file a written petition with the Graduate Advising Committee requesting such a change. In the petition, the student must present a justification for the requested change. The Graduate Advising Committee will respond in a timely fashion to the student's petition.

G. Times for Completion of Programs

Normally, a student is expected to complete a M.S. degree in two years and a Ph.D. degree in five years.

H. Semester Review

Progress of each graduate student towards a graduate degree is reviewed at the end of each semester. Graduate students that are not making satisfactory progress toward completing their degree may be removed from the program by a vote of the faculty.

DOCTOR OF PHILOSOPHY PROGRAM IN CHEMISTRY

The major features of the Ph.D. program are:

A. Coursework at an advanced level
B. Research in a novel and significant area of chemistry
C. Examinations

A. Coursework and Other Credit Required for the Ph.D. Degree

The following coursework - credit hour program will apply to all students working toward the Ph.D. in chemistry.

1. *Research Credit:* All students are required to register for research credit every semester while in residence. The number of research credits may range from 1 to 9 hours, based upon the student's academic status in the department and the number of other courses being taken.

2. *Seminar and Colloquia (Chem 796 and Chem 789):* graduate students in the Ph.D. program must register for a seminar every semester. In the first semester of residence, a student who has not yet chosen a research area is free to attend any seminar course. However, once an area has been chosen, the student attends and participates in a seminar course designated by their GRC. In Chem 796, students will present at least three graded seminars while in residence at WVU. One of these seminars will be the original research proposal that is required after a student has passed the candidacy exam. Chem 796 is designed to provide experience in collecting relevant research material, organizing the subject in a logical order, presenting the material in a clear and scientific manner, and leading a discussion at the conclusion of an oral presentation. Evaluation of the presented seminars (including original research proposal) will be by consensus of the faculty attending the student's seminar.

Colloquia are also sponsored by the Department of Chemistry in order to make it possible for students and faculty to meet with distinguished scientists and to learn of their area of research. Graduate students must register for the colloquia (Chem 789) and attend these lectures every semester.

3. *Coursework Program:* Students are expected to take a minimum of six 3-credit hour advanced courses (500-700 level), which must be included in the Plan of Study. Courses outside the department may count towards this requirement provided the Research Advisor recommends the course and the course is approved by the GAC. A final grade of B or better is required to have the course count towards satisfying this requirement. Neither seminar courses nor research credit hours count toward this six-course requirement.

Transfer credit for graduate courses taken at other colleges and universities may be allowed providing the student demonstrates proficiency in the area. However, transfer credit will not be

allowed if the student fails the Guidance Examination in that area. Transfer credit must be approved by the GAC.

4. *Grade Point Average:* The Eberly College of Arts and Sciences requires a minimum grade point average of 2.75 on all graduate courses taken while a graduate student at West Virginia University. In addition, to be eligible for the Ph.D. degree, a chemistry graduate student must have a 3.00 chemistry GPA. The chemistry GPA will be computed from 500 -700 level graduate coursework in chemistry and related graduate coursework outside of chemistry that has been approved by the GAC before the student has registered for the course.

If a student's chemistry GPA falls below a 3.0, this student is in poor standing. A student will have one semester to raise their chemistry GPA above a 3.0 or the student will become ineligible for a teaching assistantship. If a student's GPA is below a 2.75 for two consecutive semesters, the student will be removed from the program.

B. **Research**

Research is the main focus of the Ph.D. program and each research project is arranged and conducted on an individual basis. Responsibility of ensuring that the research is properly carried out lies with the student's research advisor and GRC. When the research project has been completed, as judged by the student's research advisor and GRC, the candidate shall prepare a comprehensive dissertation covering the course of the research.

The final decision on the acceptability of the research as presented in the dissertation is the responsibility of the GRC. Publication of this work in the chemical literature and presentations at regional and national meetings is highly desirable and strongly encouraged.

C. **Examinations**

An examination system has been devised to provide guidance for the faculty in evaluating the abilities, achievements, and potential of graduate students in the Ph.D. program. Four types of examinations are contained in the overall system and are administered at various stages in the Ph.D. program. These examinations are as follows:

1. Guidance Examinations
2. Candidacy Examinations – Written report and oral defense
3. Oral Defense of an Original Research Proposal
4. Final Dissertation Examination

1. *Guidance Examinations:* The purpose of the Guidance Examinations is to determine whether or not the entering graduate student has command of the four major areas of chemistry - analytical, inorganic, organic, and physical - at a level corresponding to the American Chemical Society Certified Degree of Bachelor of Science in Chemistry. The

Guidance Examinations are given during the week immediately preceding registration for Fall and Spring semesters and are required for all students prior to their first registration in the Chemistry Department. The examination in each of the four major areas will be administered and graded by the GAC. This committee will be responsible for recommending a suitable course program and schedule for each student for the first semester in residence, taking into account their total academic record. Students must demonstrate proficiency in three of the four major areas of chemistry. Those whose examination performance reveals a weakness in two or more areas will be required to remove deficiencies in all but one area by satisfactory performance in an appropriate graduate course in deficient areas or by retaking and passing appropriate Guidance Examinations. A grade of B or better in an appropriate course will be deemed satisfactory to remove the deficiency. Students have two opportunities to remove a deficiency in an area through coursework or re-examination. For students entering the graduate program in the Fall semester, deficiencies must be met before the following summer session (as a reference, this constitutes a time period of approximately 9 months). For students entering the graduate program in the Spring semester, deficiencies must be met by the end of the following Fall semester.

Any student who fails to address these deficiencies by the end of the first year of residence will be dismissed from the Ph.D. program.

2. *Candidacy Examinations:* The purpose of Candidacy Examinations is to test the ability of the student to use basic knowledge in their major field of chemistry. These examinations are in two parts: a written research progress report and an oral defense of the progress report. Special areas or combination of areas for examination may be approved for certain students who petition the faculty through the GAC for consideration of special needs or programs. In such cases where approval is granted, an appropriate examination will be arranged.

Research Progress Report

By the last week of classes of the third semester in residency, the student will provide a draft of their written report to their GRC detailing the current progress in their research project. The GRC will provide feedback on the written report by the beginning of the fourth semester in residence. The final report will be due by the mid-semester date of the fourth semester in residence. This report will contain a comprehensive review of the pertinent literature and applicable scientific concepts, a discussion of current results, a description of studies needed to finish the project, a discussion of expected results and alternative approaches, and a timeline for completing the work. Specific details concerning the format of the written progress report will be provided in a separate document (See Written Report Guidelines). The written report will be graded as a Pass/Fail. The student will be allowed one opportunity to rewrite the report, but this rewrite must be completed two weeks before the end of the semester. If the student fails

the written progress report, they will have the option to petition the GAC to be transferred to the M.S. program track. Students that transition to the M.S. track will be supported for only one additional semester.

Ph.D. students will also be required to defend an oral progress report in the fourth semester of residence. This presentation can be attended by anyone in the Chemistry department. The content of the presentation is similar to that contained in the written progress report. That is, this presentation will contain a comprehensive review of the pertinent literature and applicable scientific concepts, a discussion of current results, a description of studies needed to finish the project, a discussion of expected results and alternative approaches, and a timeline for completing the work. After the presentation, the student will answer questions from the entire audience in attendance. Then, the student will answer questions from their GRC in a closed session. Any member of the Chemistry faculty can attend the closed session, but only members of the GRC will vote in determining if the student passes or fails.

There are three possible outcomes for the examination: (1) pass, (2) conditional pass, or (3) fail. If the student conditionally passes the examination, the GRC will recommend an appropriate course of action. The student may have no more than one month after the date of the oral examination to satisfy the conditions stipulated by the GRC. However, the Committee may set a shorter deadline for satisfying the conditions. If the student fails the oral progress report, they will have the option to petition the GAC to be transferred to the M.S. Program. The GAC in consultation with the GRC will recommend the appropriate M.S. program track. Students that transition to the M.S. track will be supported for only one additional semester.

If exceptional circumstances, including the student taking a leave of absence, prevent the presentation of of the written report or the oral defense, the student may petition the GAC two weeks before the deadline for an extension.

Collectively, the written and oral research progress report constitutes the candidacy exam.

Oral Defense of an Original Research Proposal

When a student successfully completes the research progress report requirement, the student will then be eligible to present and defend an original research proposition. **The proposition must demonstrate originality and independence on the part of the student. Therefore, the proposition should contain original contributions from the student**. This presentation will be presented in the appropriate CHEM 796 section and can be attended by anyone in the department. The proposal must be successfully

completed before the end of the fourth year in residence. A written proposal must be provided to the student's GRC and faculty associated with the appropriate CHEM 796 section 4 weeks before they are scheduled to present. Specific details concerning the format of the written proposal will be provided in a separate document (See Original Proposal Guidelines). The oral examination presented during the appropriate CHEM 796 section will be evaluated by present graduate faculty.

There are two possible outcomes for the original proposal: (1) pass or (2) fail. If the student fails the original proposal, the GRC will recommend an appropriate course of action. The student may have no more than three months after the date of the oral examination to satisfy the conditions stipulated by the GRC. However, the Committee may set a shorter deadline for satisfying the conditions.

3 *Final Dissertation Examination:* After the Ph.D. dissertation has been prepared, a preliminary copy must be submitted to the student's GRC at least 2 weeks prior to the Final Dissertation Examination. This examination will include a defense of the results and conclusions through an oral presentation which is open to the public. The period of questioning by the GRC will be conducted in a separate session. This portion of the examination is open to the faculty. However, the outcome of the examination will be determined by the student's GRC. Upon successful completion of this examination, the student must submit a final version of the dissertation approved by the GRC. A copy of the dissertation will be submitted to the Department and an electronic copy of the dissertation will be submitted according to the guidelines in the Graduate Catalog. Students are reminded that they must meet university and college deadlines for submission of the dissertation and other required forms. This completes the necessary requirement of the Department of Chemistry and West Virginia University for the award of the Ph.D. degree.

MASTER OF SCIENCES PROGRAM IN CHEMISTRY

There are two distinct tracks for the Chemistry M.S. These are the thesis track and coursework track. The principal requirements of the Chemistry M.S. program are divided into general categories:

A. Guidance Examinations. (Thesis and Coursework tracks)
B. Coursework: exposure to graduate level subject matter in the major areas of chemistry and particularly in the chosen research area. (The number of courses required differs between the two tracks).
C. Research. (Optional for the coursework track)
D. Thesis Defense: to measure the ability of the student to defend scientific conclusions based on their research project. (Thesis track only)

A. Coursework

General WVU requirements for an M.S. degree state that a minimum of 30 credit hours must be satisfactorily completed. A program of courses must be selected to satisfy the requirements of both the Department of Chemistry and the Eberly College of Arts and Sciences. The general coursework requirements are as follows:

Summary of Chemistry M.S. Credit Hours

Thesis Track	Coursework Track
1. Research (up to 6 credit hours)	1. Seminars (up to 3 credit hours)
2. Seminars (up to 3 credit hours)	2. Research (up to 3 credit hours)
3. 500-700-level coursework (at least 21 credit hours)	3. 500-700-level coursework (at least 24 credit hours)

1. *Research (Chem 797)*: All thesis track chemistry graduate students must register for research each semester while in residence at WVU. Up to a maximum of 6 credit hours of research may be applied toward the thesis track M.S. degree in Chemistry.

2. *Seminar and Colloquia (Chem 796 and Chem 789)*: All graduate students in the M.S. thesis track must register for both seminar and colloquia every semester. Coursework track M.S. students are strongly encouraged to enroll in a seminar and must register for colloquia every semester.

In the first semester of residence, a student who has not yet chosen a research area is free to attend any seminar course. However, once an area has been chosen (thesis track), the student must attend and participate in the seminar course appropriate to that area. These seminars are designed to provide experience in collecting relevant research material, organizing the subject in a logical order, presenting the material in a clear and scientific manner, and leading the discussion at the conclusion of the oral presentation.

Colloquia are also sponsored by the Department of Chemistry in order to make it possible for students and faculty to meet with distinguished scientists and to learn of their area of research. Graduate students must register for the colloquia (Chem 789) and attend these lectures every semester. A graduate student may petition the GAC to be exempted from this requirement on a semester-by-semester basis.

Up to a maximum of 3 credit hours of Seminar and Colloquia may be applied toward the thesis or coursework track M.S. degrees in Chemistry.

3. *500-700-level Coursework:* Students are expected to take a minimum of **seven** 3-credit hour advanced courses (500-700 level) for the thesis track M.S. degree and **eight** 3-credit hour advanced courses (500-700 level) for the coursework track M.S. degree. For both tracks, these courses will be included in the Plan of Study. A final grade of B or better is required to have the course count towards satisfying this requirement.

Transfer credit for graduate courses taken at other colleges and universities may be allowed providing the student demonstrates proficiency in the area. However, transfer credit will not be allowed if the student fails the Guidance Examination in that area. Transfer credit must be approved by the GAC.

4. *Other Options:* Up to 10 credit hours of graduate level coursework taken outside the chemistry department may be applied toward the M.S. degree if approved by the GAC. For thesis track M.S. degree students, decisions on approval will be made in consultation with the student's GRC. Interdivisional and interdisciplinary programs may be arranged to suit the needs of individual students.

5. *Grade Point Average:* The Eberly College of Arts and Sciences requires a grade point average of 2.75 on all graduate-level courses (500-level and above) taken at West Virginia University. In addition, to be eligible for the M.S. degree a chemistry graduate student must have a 2.75 chemistry GPA computed for coursework taken to satisfy the M.S. degree requirements for both tracks as described in the above sections.

B. Research

Graduate students in the thesis track are encouraged to begin research as early in their studies as ability and interests permit. Usually students begin research in their first semester of residence. The selection of a research advisor will be made according to the guidelines specified in the introduction. The culmination of graduate research is the presentation of the results and conclusions in a M.S. thesis. Publications of this work in the chemical literature and its presentation at regional and national meetings is highly desirable.

C. Examinations

An examination system which is used to measure the ability and achievement of graduate students in the M.S. program contains two types of examinations:

1. Guidance Examinations
2. Final Thesis Examination (Thesis Track)

1. *Guidance Examinations:* The purpose of the Guidance Examinations is to determine whether or not the entering graduate student has command of the four major areas of chemistry - analytical, inorganic, organic, and physical - at a level corresponding to the

American Chemical Society Certified Degree of Bachelor of Science in Chemistry. The Guidance Examinations are given during the week immediately preceding registration for Fall and Spring semesters and are required for all students prior to their first registration in the Chemistry Department. The examination in each of the four major areas will be administered and graded by the Graduate Advising Committee. This committee will be responsible for recommending a suitable course program and schedule for each student for the first semester in residence, taking into account their total academic record. Students must demonstrate proficiency in three of the four major areas of chemistry. Those whose examination performance reveals a weakness in two or more areas will be required to remove deficiencies in all but one area by satisfactory performance in an appropriate graduate course in deficient areas or by retaking and passing appropriate Guidance Examinations. A grade of B or better in an appropriate course will be deemed satisfactory to remove the deficiency. Students have two opportunities to remove a deficiency in an area through coursework or re-examination. For students entering the graduate program in the Fall semester, deficiencies must be met before the following summer session (as a reference, this constitutes a time period of approximately 9 months). For students entering the graduate program in the Spring semester, deficiencies must be met by the end of the following Fall semester.

2. *Final Thesis Examination (Thesis track only):* After the M.S. thesis has been prepared and examined by the student's GRC, the Final Thesis Examination will be arranged. A copy of the thesis will be provided to the GRC at least two weeks before the Final Thesis Examination. This examination will be oral in nature and will include defense of the results and conclusions of the thesis. The examination is open to the faculty. However, the outcome of the examination will be judged by the student's GRC alone. Upon successful completion of this examination, the student must submit a final version of the thesis approved by the GRC. A bound copy of the thesis will be submitted to the Department and an electronic copy of the thesis will be submitted according to the guidelines in the Graduate Catalog. Students are reminded that they must meet university and college deadlines for submission of the thesis and other required forms. Successful completion of this examination completes the last requirement of the Department of Chemistry and West Virginia University for the award of the M.S. degree.

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