

GRADUATE HANDBOOK  
IU CHEMISTRY

2014-2015

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# Graduate Handbook IU CHEMISTRY 2014-2015

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## 1. GENERAL INFORMATION

### 1.1 Chemistry Graduate Office, Director of Graduate Studies and Graduate Committees.

The **Graduate Office** is the focal point for most administrative functions associated with the graduate program. The graduate program is under the supervision of a faculty member, who is appointed as the **Director of Graduate Studies**. The Graduate Office is managed by the **Administrative Assistant for Graduate Affairs** with the assistance of the **Admissions Coordinator**. These individuals are available for advice and help with all aspects of the graduate program. They can also provide information and direction in seeking assistance for a variety of other matters.

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*Toni Lady, Amar Flood, Dalane Anderson*

Associated with this office are two separate faculty committees that serve the graduate student population:

The **Admissions Committee** is largely responsible for the processing of applications from prospective graduate students and consists of a chairperson and faculty representatives from each of the areas of chemistry (analytical, chemical biology, inorganic, materials, organic, and physical). This committee reviews applications from prospective graduate students, recommends admission and financial assistance to qualified

applicants and coordinates visits by prospective students.

The **Graduate Standards Committee** supervises the maintenance of records of all currently enrolled graduate students and serves as an advisory group in the planning of a program of study for each graduate student. It is chaired by the Director of Graduate Studies and includes a representative from each area within Chemistry. In addition, this group periodically reviews the record of each graduate student, selects awardees of prizes and fellowships, recommends termination of enrollment in the graduate program when progress toward an advanced degree is unsatisfactory, and considers petitions for readmission from any student whose enrollment has been terminated.

**1.2 Full-Time Student Status.** Students holding fee scholarships must **register for the maximum 30 credits** during each 12-month period beginning with the start of the fall semester. Research credits are taken as necessary to reach this total using course code C8X0 (number code for X depends upon the major division; analytical X = 1, chemical biology X = 8, inorganic X = 3, materials X = 2, organic X = 4, physical X = 6). Students enroll in 12 credits in both the fall and spring semesters and 6 during the summer. It is very important that students add additional credits of C8X0 or other courses when they withdraw from a course, since fees paid for the dropped course will be forfeited otherwise. Students normally receive a deferred or **R** grade for any research credits (C8X0) in which they are enrolled during the first year. In subsequent years, either a letter grade (**A-F**) or a deferred grade (**R**) will be awarded at the discretion of the research advisor.

It is especially important that PhD students are **enrolled every semester** until they obtain the PhD. Failure to do this will terminate enrollment in the PhD program and necessitate formal readmission to the Graduate School in order to complete the degree program. This is only granted upon a satisfactory explanation and payment of past fees. MS candidates are not required to enroll after completion of their course and research requirements **unless** they hold a student

appointment as an Associate Instructor or Research Assistant, in which case they must enroll for at least 6 credit hours.

Beyond 3 years, the course enrollments usually change. Students who have earned 90 or more hours of graduate credit **and** who hold student appointments as Associate Instructors, Graduate Assistants or Research Assistants that amount to at least 0.375 FTE (15 hours per week work-load) are required to enroll for six hours of credit in G901 or other courses during each semester (up to 6 semesters, which is equal to 3 years for most students.) that they continue to hold an appointment. Summer registration is not required unless the student is graduating during the summer (see graduate office).

**1.3 Transfer of Credits.** Graduate School regulations permit students to transfer up to 30 hours of graduate credit for approved courses that count towards the required 90 credits for the PhD. This requires special petition and such transfers do not automatically fulfill any departmental major or minor course requirements, unless the individual Advisory Committee specifically approves this. In general, credits transferred must be lecture courses for which a grade of B or better was obtained that were taken in a U.S. graduate institution and not previously used for credit towards a Bachelors degree. Courses that were taken as an undergraduate in excess of the minimum graduation requirements for the bachelor's degree or as a graduate student towards completion of an MS are acceptable. Courses that are not substantially equivalent to courses offered here or that are equivalent to courses the student has taken here may not be approved.

Such credit transfers are usually made at the time of advancement to candidacy (occurring after 5<sup>th</sup> semester) but can be made at any time prior to this. To count towards the 90 credits required for the PhD, the courses must have been taken **within 7 calendar years** of advancement to candidacy.

**1.4 Interdepartmental Programs.** Chemistry participates in several interdepartmental programs. Details of these

programs are given in the *University Graduate School Bulletin*:

<http://www.indiana.edu/~bulletin/iu/gradschool/2013-2014/index.shtml>

a. Combined MD/PhD Program for Medical Students: This program enables medical students to obtain a PhD or MS degree along with the MD. Normally PhD work is commenced only after the first year of medical studies, but students in the program are encouraged to participate in the C500 interviews (see Section 4) and associate themselves with a research group as soon as possible.

b. Chemical Physics Program: This program permits students with strong physical interests to combine studies in physics and chemistry.

c. Environmental Chemistry and Geochemistry: This program allows students with multidisciplinary interests in the fields indicated to develop their contacts with related departments.

d. Biochemistry Program: This graduate program integrates the chemical and biological sciences.

e. Dual MS Chemistry/MSES: This is a dual Master's Degree program involving Chemistry and the School of Public and Environmental Affairs (SPEA).

f. Minor in Energy Sustainability: This is a 9-credit minor that includes course options in Geology, Geography, Physics, Biology, Chemistry, and SPEA.

g. Minor in Quantitative and Chemical Biology: This is a 6-credit minor that includes a selection of courses from Chemistry, Biology, Biochemistry, Physics, and Medical Sciences.

**1.5 Introduction to Research (C500).** All students begin their research experience by taking this course during their first year of graduate work. It provides a mechanism to learn about an area of research before committing to any specific research program and even students with considerable research

experience are expected to enroll in C500. (See 4 for a more complete description of C500.)

**1.6 Major and Minor Courses.** The middle digit of chemistry course listings usually indicates the specific area of the course with regards to fulfilling major and minor requirements. It should be noted that C500 does not fulfill any lecture course requirements for the MS or PhD major or minor.

Students are expected to take courses until the MS and PhD requirements are completed. MS students should be particularly careful to plan their programs to finish course work early since they will not normally receive fee scholarships unless they hold student appointments.

**1.7 Interdisciplinary Research.** An increasing amount of research is being conducted at the interface between two of the traditional disciplines. In these cases, student are encouraged to discuss the course enrollments that best suit their research activities. In such cases, permission to swap one major or minor course requirement is granted by the divisional course advisor or by the Director of Graduate Studies.

**1.8 Courses outside the PhD requirements.** Students are encouraged to consider relevant courses in other departments. In particular, courses listed under the various interdepartmental programs such as Biochemistry, Molecular, Cellular, and Developmental Biology, Chemical Physics, and Environmental Chemistry are recommended.

Many students take applied mathematics courses, statistics courses, or Computer Science courses as a critical aid to their research program. It should be noted that not all courses count towards the 90 credits required for the PhD. Only those courses listed in the *University Graduate School Bulletin* are eligible for graduate credit.

<http://www.indiana.edu/~bulletin/iu/gradschool/2013-2014/index.shtml>

**1.9 Research Advisor.** Each student

engaged in research must be associated with a Research Advisor. Students express their preferences for C500 Research Advisors through a specific procedure of presentations and interviews. Upon completion of the C500 course, PhD thesis advisors are established by mutual agreement between the student and the faculty member involved, subject to approval by the Graduate Standards Committee. The Research Advisor guides the student through coursework and research leading to a degree and serves as chairperson of the PhD Advisory and Research Committees, if the student is accepted for work leading to that degree.

**1.10 PhD Advisory and Research Committee.** At the end of the first year, students are asked to begin selecting their committee members. In addition to the student's research advisor, the committee is composed of two other faculty members within the student's declared major, and one faculty member typically representing the student's minor. The student can suggest one of the major representatives and the minor representative, and the Director of Graduate Studies appoints the second major representative. The final committee composition will sometimes be affected by availability of certain faculty to serve on the committee. The students will meet with their committee members once every year during the summer semesters. More information on this committee can be found in Section 8.2.

**1.11 5-Year PhD Culture.** Students are encouraged to take control of their advancement through their own course of studies leading to a PhD within 5 years. The relationship between student and mentor and the expectations placed upon the student changes each year. To aid with each of these transitions, incoming C500 students will attend a Professional Development Seminar series and students in subsequent years will attend annual panel discussions that are matched to their year in the program.

Students are expected to ensure that they stay on track throughout their PhD as they complete C500, schedule their 5<sup>th</sup> semester candidacy exam, complete all the related paperwork, work towards and submit papers in a timely manner, attend conferences and workshops to develop

professionally and to defend their thesis. A 5-year timeline is provided as a guide (see later). Any deviations from the timeline are likely to occur and should be addressed with the Research Advisor and in consultation with the Director of Graduate Studies to create a modified timeline or to get back on track. Any students who are not advancing towards their PhD are at risk of being placed on probation with the possibility of being dismissed from the program unless specified milestones are being attained in a timely manner (see Section 11: When Things Go Wrong for more guidance).

## **2. FINANCIAL ASSISTANCE**

**2.1** Most entering PhD students are granted some form of financial support. If the recipient remains in good standing in the Graduate School, this support will normally be continued. However, this is a limited commitment and is not guaranteed to extend beyond four semesters for MS candidates and eight semesters for PhD candidates (summers excluded). Financial support will only continue if the student is in good standing and making satisfactory progress toward the PhD. Financial assistance will generally be in one of the following three forms: (a) Associate Instructorship, (b) Research Assistantship, or (c) Fellowship or Traineeship.

**2.2 Associate Instructorships (AI).** An Associate Instructorship not only pays the major initial cost of an education, but gives the student experience in leadership and training in the fundamentals of chemistry. All PhD candidates are expected to teach, at least part-time, for two semesters. Most Associate Instructorships are half-time appointments. Most students serve as Associate Instructors during their first 2 - 6 semesters of graduate work before being transferred to Research Assistantships. In order to be eligible for continued support by AI appointment, students must satisfactorily fulfill all of the responsibilities of the appointment.

**2.3 Research Assistantships (RA).** Research Assistantships are awarded on the

basis of good academic standing, research experience, and the involvement of recipients in research problems for which assistantship funds are available. Stipends are generally comparable to those of Associate Instructorships. In all cases, the specific terms of a Research Assistantship are decided upon by the individual faculty member responsible for the funds involved.

**2.4 Fellowships.** A number of sources for fellowship support for particularly well-qualified students exist. Several federal agencies (e.g., NSF, DOD) have competitive programs that usually require application early in the first-year of study. Various private institutions also fund fellowships, often in specific research areas. A link to these and other programs can be found on the Graduate Program website. The Graduate Office will assist students with applications insofar as possible.

**2.5 NSF Fellowships Applications.** As a part of the C500 program, students are required to write an application for the NSF Graduate Student Fellowship. Students are also expected to apply for the fellowship in their subsequent 2<sup>nd</sup> year as well.

**2.6 Graduate School Fellowships.** The Graduate School sponsors a limited number of fellowships for advanced students in addition to supplemental fellowships for entering students. The Chemistry Department annually awards a number of fellowships for advanced students. These may be either full fellowships or of the partial or supplemental type. Students are usually nominated by their Research Advisor for departmental awards. The Graduate Office will bring information concerning fellowships to the attention of qualified individuals whenever possible.

### 3. SCHOLASTIC STANDARDS

**3.1** Continuation in the University Graduate School is dependent upon performance in courses, research, and examinations; progress in research and attitude toward advanced study are key considerations in Graduate Committee decisions.

**3.2 Grade point average/probation.** When the overall grade-point average falls below 3.0, a student is automatically placed on academic (COAS) probation by the College of Arts and Sciences Graduate Office. Since the College considers both research (C8X0) and lecture course grades in judging probation cases, it is possible for good grades in research to offset poor grades in lecture courses. However, the Chemistry Department requires a 3.0 grade-point average for all coursework (major and minor courses) in addition to the College's overall GPA requirement. This means that students may be placed on probation by the College at the request of the Department, based on insufficient progress toward degree.

Students placed on probation at the end of their first semester of graduate study in the Department may be dismissed from the graduate program at the end of their second semester of enrollment. After the first year of graduate study in the Department, students on probation may be subject to dismissal at the end of the semester of notification if adequate improvement in grades is not demonstrated. For a student to regain normal standing after being placed on probation, the grade-point average during the following semester must be high enough to achieve an *overall* average of 3.0 or higher. In certain cases in which a student's cumulative average is raised, but not to the 3.0 minimum grade-point average, an additional semester may be granted to attain an overall 3.0 average.

For purposes of computing grade-point averages, a plus (+) grade is considered 0.3 higher than the grade-point unit, and a minus grade (-) is 0.3 less; accordingly, an

overall B- average is not satisfactory. Grades below 2.0 are *not counted toward the completion of degree requirements* but are counted in determining a student's grade-point average.

**3.3 Research grades.** The grads accumulated during research courses C500, X800 and C8X0 are not used by the Department in computing averages, although they are considered in making probation or termination decisions by the College of Arts and Sciences Graduate Office. Grades in courses outside of the major and minor are also not used in the computation of grade-point averages by the Department.

**3.4 The grade of Incomplete (I).** It is the responsibility of a student who has incurred the grade of Incomplete (I) in any course to fulfill the requirements of that course within one calendar year from the date on which the grade was recorded. The student is expected to complete all work in time for the instructor to assign a new grade before the expiration of this time period. If a student is unable to meet this requirement with cause and needs further time to complete the course, a petition for an extension of the deadline to the Graduate School must be submitted through the Graduate Office.

**3.5 Deferred Grade of R.** Several Graduate courses such as C500, X800 and C8X0 are not necessarily completed in the course of a single semester. For these courses a deferred grade of **R** may be awarded at the end of a semester to indicate that the appropriate grade will be given at a later time when the coursework is completed. Since students accumulate most **R** grades after advancement to candidacy, it is customary to request removal of all **R** grades just prior to the final examination; however, this may be done at any time. **All such changes must be processed through the Graduate Office.**

**3.6 Minimum credits.** All students, including those on probation, are expected to carry normal workloads. Students on probation during the first or second year of graduate study are required to enroll in **at least 6 hours** of graduate coursework that count toward an advanced degree.



#### 4. INTRODUCTION TO RESEARCH (C500)

**4.1** Research is the main emphasis of both the MS and PhD programs. Choice of research advisor is therefore tremendously important. The department has therefore implemented a mechanism by which students can be informed of research done in different laboratories, and also have the opportunity to switch research groups after two semesters, should the students and faculty decide another research group would be a better match for their interests.

**4.2 Chemistry C500.** Chemistry C500 is a course for all new graduate students enrolled in the PhD programs in chemistry. Normally, the course begins in the fall semester and continues through the second semester of the academic year for a total of 6 credit hours. Two important purposes of the course are to (1) stimulate an acquaintance with all members of the chemistry faculty and to (2) promote an active start in research

**4.3 Choosing a Research Group.** Students are strongly encouraged to read about the active research projects in faculty laboratories by visiting faculty web pages, reading papers and meeting with senior students. Students should plan to spend 5-15 hours each week investigating multiple groups. The C500 course features a mechanism by which faculty and incoming graduate students can become acquainted that involves Research Poster Sessions. All student will be expected to attend A L L four poster sessions to become informed of the variety of research projects being conducted in the department. This exposure provides another opportunity to identify which research and research group students that you would like to learn more about.

Students are required to arrange to have multiple types of interactions with the research group of their interest. These include the following: (1) meetings with faculty, (2) shadowing student, (3) attending group meeting(s), (4) meetings with students to discuss research, (5) attending a group's social gathering, etc. Students are required to meet with at least one assistant professor in their

area of interest. Students should interact with at least four research groups in case the student decides to switch groups after or before completion of their C500 project. AS WELL as to become acquainted with potential committee members. A signature sheet will provide a comprehensive list of topics that the student can check off. For the final selection, students are required to have at least four points of interaction with their 1<sup>st</sup> of 1<sup>st</sup> equal faculty selection.

The C500 Interview Sheets are due in the Graduate Office with an order of preference for a C500 advisor on October 1. The Director of Graduate Studies, in consultation with the relevant faculty members, will assign each student to a C500 advisor, pending approval by the Chair of Chemistry. Graduate students will then be assigned to a lab to begin their C500 course project. The final C500 report is due in the Graduate Office on **Friday, April 17, 2015**. The report needs to be reviewed by the Research Advisor two weeks PRIOR to the due date. Please see the C500 handbook for details on the C500 report.

Students sometimes join the Department in the summer prior to the start of graduate study to work as research assistants under the direction of specific faculty members. This early start is provided for the purpose of gaining additional research experience and does not represent a commitment from the student to join that particular research group or from the faculty member to take the student as a C500 group member. These students must enroll in the C500 course in the fall and follow the same protocol as the rest of the entering class.

#### **Professional Development Seminar.**

Beginning the first week of courses, the C500 seminar series will take place over the course of 10 weeks. This seminar series is required and help prepare students for entry into graduate life. A syllabus will be made available at the start of the semester. The series includes a mixture of lectures, activities and panel discussions that will involve various faculty members and senior graduate students.

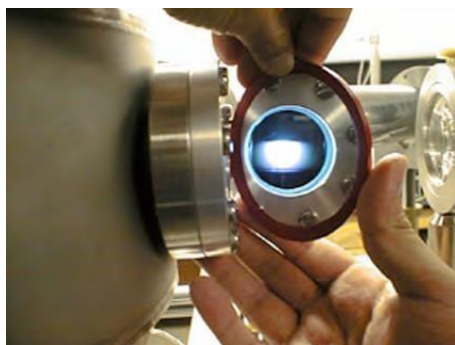
Topics include choosing a group, conducting good research, preparing CVs, expectations of graduate life, teaching strategies and ethics.

## 5. SECOND-YEAR REQUIREMENT

**5.1** All PhD students in the Department are required to register for a minimum of two semesters of X800 (in their third and fourth semesters) prior to their fifth semester of residency in the appropriate second-year course. The course the student selects will be based on his or her major area. Analytical Majors will take the course A800; Chemical Biology, B800; Inorganic, N800; Materials, M800; Organic, R800; and Physical, P800. Each of these courses earns one credit hour and each student must earn at least two credit hours. These courses do not count towards the 12 credit-hours required to satisfy the major coursework requirements or towards the minor credit-hours required for a PhD in chemistry.

**5.2 Grades.** Students will be assigned a letter grade for their second-year requirement course at the end of each semester. A grade of R may be assigned to be replaced by a letter grade upon completion of the final semester of the course.

**5.3 Course descriptions.** Details of the second-year course requirement vary depending upon the area of chemistry in which the student is majoring. Specific descriptions for each course are provided in Appendix I at the end of this document.



## 6. FIFTH-SEMESTER EXAMINATION

**6.1** Before a student is admitted to candidacy for the PhD degree, the Graduate School requires that a candidacy examination be passed.

**The date of the exam needs to be scheduled during Fall 2016 prior to July 1, 2016.**

**6.2 Specific components of the fifth-semester examination.** To satisfy this requirement, Chemistry PhD candidates (1) prepare a written progress report, (2) give a research seminar and (3) are administered an oral examination by the Advisory Committee not later than the end of their fifth semester of residence. (4) All students majoring in Chemical Biology will sit for a single written exam in the week prior to the scheduled oral defense, as part of the fifth-semester examinations. The written exam is structured as 4-6 questions to be taken over a single 24-hour period with any mixture of "open" and "closed" book questions, and will be administered by the advisor with input from other members of the advisory committee.

**6.3 Extension.** If an extension of the fifth-semester evaluation is needed, the student should first submit a petition to the Director of Graduate Studies. This petition must be supported by the Research Advisor and the Advisory Committee and must state reasons for such a request. If this petition is approved, the student must immediately arrange for the fifth-semester examination to be held within a reasonable time frame, usually early in the following semester. Only under extraordinary circumstances can fifth-semester examinations be delayed longer, and such extensions will require approval from the Director of Graduate Studies. *The desire to complete additional research is not an appropriate reason to delay the fifth-semester examination.* **Failure to adhere strictly to these guidelines will result in placement on academic probation with contingency to termination of enrollment in the degree program.**

#### 6.4 Fifth-semester report requirements.

The student should meet with his/her advisor to discuss the content of the report. The report should contain on the order of 50 pages. Especially long experimental sections required by the research advisor may be included in an appendix. Guidelines for preparing the report are given below:

1.Introduction Provide a reasonable historical introduction to your project and to outline the goals for your research. *Particular focus on quality of this chapter is more valued than the length of this section.*

2.Experimental This section should be in a concise, well-written format that is characteristic of the best journals in your field. This section should be well-organized, avoiding redundant or irrelevant information.

3.Results and Discussion Again, a concise analytical description of the results of experiments or computational studies, followed by a discussion of the implications of the results and how they relate to the initial motivation of the research.

4.Plan for completing the thesis This section should be carefully thought out and provide a reasonable amount of detail, including feasibility studies. Though the content of your thesis could be very different from your proposed work, this component of the 5<sup>th</sup> semester report should provide some long range guidance in formulating the thesis.

A copy of your report must be submitted to the graduate office after you have successfully completed the oral exam.

**6.5 Timeline.** Completed candidacy forms must be submitted to the University Graduate School no less than six months prior to defense. The Graduate School approves the student's advancement to candidacy.

**6.6 Deficiencies in the fifth-semester exam.** In the event that not all components of the candidacy exam are deemed by the graduate committee as adequate for advancement to candidacy, several courses of action may be considered.

- i. Students with a sufficiently large body of research completed to date, as judged by the committee, may be advised to pursue an MS degree. If, in the completion of the master's research, the student demonstrates strong potential for completion of PhD research, the student may be advised to petition the graduate office for reinstatement into the PhD program.
- ii. If the student's coursework is strong, but the body of research is deemed by the committee to be inadequate, the student may be advised to consider the MAT program OR the dual MS Chemistry/MSES program, both of which are coursework based and require no thesis.
- iii. If failure of the fifth semester examination is associated with extraordinary circumstances (sudden illness, family emergency, catastrophic laboratory equipment failure, etc.), the student may be allowed to retake the oral examination and/or rewrite the progress report. The Graduate Bulletin states that students can retake the exam no more than once. This option may only be taken with full consent of the graduate committee.



## 7. MASTER'S DEGREES

**7.1 Master of Science (MS) Degree.** This degree may be conferred upon the holder of a bachelor's degree or an MS in another discipline who completes the requirements specified below. According to Graduate School regulations, all work for the degree must be completed within five years.

**7.2 Major.** A major may be selected from the following divisions of chemistry: analytical, chemical biology, inorganic, materials, organic, or physical.

**7.3 Credit and Courses.** A total of 30 hours of graduate credit with a minimum of 9 credit hours of major coursework, and 21 credit hours of research are required.

**7.4 Thesis.** A thesis is required. This must embody the results and interpretation of original research or, with prior permission of the Graduate Committee, a comprehensive review of a significant chemical literature. The thesis needs to be filed electronically with the University Graduate School, following the guidelines found here:

<http://graduate.indiana.edu/theses-dissertations/formatting/masters.shtml>

<http://graduate.indiana.edu/theses-dissertations/submission/masters.shtml>

The student should provide a bound hardcopy to the Research Advisor if the Advisor requests it. Two members of the graduate faculty and the Director of Graduate Studies must approve the thesis before the student can be recommended for the Master of Science degree.

**7.5 Master of Arts for Teachers (MAT) Degree.** See the *Bulletin of the University Graduate School* for information and special requirements of this joint program with the School of Education. It should be noted that only those who are certified to teach high school chemistry in Indiana are eligible for this degree.

**7.6 Dual MS Chemistry/MSES Degrees.** See the *Bulletin* for information and special requirements of this dual degree program in Chemistry and Environmental Science with SPEA. A minimum of 51 total credit hours is required, with a minimum of 21 credits required in both chemistry and environmental science, distributed among six areas of chemistry and environmental science. Students must have an approved experiential component (e.g., internships). The thesis requirement is waived for this dual-degree program.

**7.7 Steps in Completion of Master of Science Degree.** The following is a checklist showing the timing and responsibility for steps in obtaining the MS degree. A student should refer to this list throughout his or her progress toward the degree to ensure that all necessary action is taken.



## STEPS TO THE MASTER OF SCIENCE (MS) DEGREE IN CHEMISTRY

Individual or Office Responsible for Action	Step	Timing
1. Director of Graduate Studies	Interview appointment with Graduate Committee to plan course of study	During pre-semester enrollment period
2. Student	Choice of Research Advisor (usually through C500)	During first semester
3. Student	File application for MS degree at Graduate Office; remind Research Advisor to remove R grades	Early in semester in which student plans to graduate
4. Student	Completion of course requirements	No later than last semester in school
5. Student and Research Advisor	Unbound copy of thesis in final form approved by Research Advisor for review by faculty referee	At least two weeks before completion of step 7
6. Student and Director of Graduate Studies	One unbound copy of thesis in final form to be approved by Director of Graduate Studies	At least one week before completion of step 7
7. Student	Submit electronic copy of thesis online through ProQuest	By the 15 <sup>th</sup> of the month student plans to graduate
8. Student	File original signed Acceptance Page to the University Graduate School	By the 27 <sup>th</sup> of the month the student plans to graduate (except May and December)
9. Director of Graduate Studies	Recommends to Graduate School that degree requirements have been satisfied	Within two weeks after completion of step 7
10. President (upon recommendation of Dean of Graduate School)	Degree awarded	Approximately one month after step 7 (degrees are awarded monthly)
11. Student	<b>Formally check out with Chemistry Business Office</b>	

## 8. DOCTOR OF PHILOSOPHY DEGREE

**8.1** The program leading to the PhD degree emphasizes the attainment of high ability and knowledge in a specialized area of chemistry, but it also requires the further development of broad knowledge and experience in the field. By the time the degree is earned, the student should show promise of becoming a capable and independent investigator in chemistry.

### **8.2 Advisory and Research Committees.**

The Graduate School requires that students in doctoral programs be assigned an **Advisory Committee** no later than one year after admission. In the Department of Chemistry, this is a four-person committee chosen by the student in consultation with the Research Advisor that ordinarily becomes the **Research Committee** upon admission to candidacy. The student selects a second major area representative and a minor representative. The Graduate Standards Committee appoints the third major representative. This committee must be formed before the start of the second year of residence. Students will be required to meet with their committee once each year to provide a brief status update. This will help students better gauge progress towards their degree.

This committee cannot be formally nominated as the Research Committee until the student has been advanced to candidacy, but it is anticipated that the members of this Advisory Committee will eventually serve on the Research Committee. The principal functions of the Advisory Committee are to approve an outline of course of study, advise the student on research during the period prior to advancement to candidacy and conduct the fifth-semester review of overall progress.

After completion of requirements for candidacy, the Research Committee should be formally nominated. This committee should immediately consider and formally approve the student's proposed thesis outline, advise the student on research throughout its subsequent progress, eventually conduct the final doctoral examination, and approve or reject the thesis presented by the student.

**8.3 Basic Courses.** Each student is required (unless specifically exempted by the Graduate Standards Committee) to take the basic graduate level courses in the major field and all beginning graduate students are

expected to enroll in C500. Organic students take Spectrometric Methods of Structure Determination (C503). Inorganic students enroll in Spectroscopic Methods (C502). Analytical students take Chemical Instrumentation (C501). Materials students are expected to take Fundamentals of Materials I (M501) plus Fundamentals of Materials II (M502). All students must take the second-year requirement course during their third and fourth semesters: A800, B800, N800, M800, P800 or R800.

**8.4 Major.** A major may be taken in analytical, chemical biology, inorganic, materials, organic, or physical chemistry. A **minimum** of 12 hours, exclusive of research, is required for the major. In some instances in which a student has been exempted from one or more required courses in the major field, he or she may ask the Director of Graduate Studies to petition the Graduate School for acceptance of fewer than 12 hours of formal course work for the major.



**8.5 Minor.** One minor is required that consists of a minimum of two courses that may be either within or outside of the Chemistry Department. If a chemistry student elects an outside minor, all requirements established by the outside department must be satisfied. If an inside minor is chosen, the student must take at least 6 credits in areas other than the major. These areas need not be isolated to just one division. Students are suggested to discuss the best courses with their Research Advisor.

**8.6 Outline of Course of Study and Appointment of Advisory Committee.** The requirements for coursework in Chemistry are minimal. Accordingly, careful selection and planning are required in order to achieve

maximum coherency and educational benefit. Since most of the course requirements are met during the first two years, practical considerations require that a complete course program be planned well before the start of the second year of studies. The completion of this step is formally marked by submission to the Graduate Office of an **Outline of Course of Study** together with the Graduate School **Appointment of Advisory Committee** form. Both forms should be signed by the four members of the Advisory Committee. By their signatures, the faculty members involved indicate approval of the planned outline of coursework.

It is recognized that this plan of course work may need to be revised in some cases. A student wishing to make changes must get the permission of the Advisory Committee. The course outline forms are kept on file in the Graduate Office. These should be modified and approved.

**8.7 Fifth-Semester Review.** Each PhD candidate will be examined orally by his or her Advisory Committee not later than the end of the fifth semester of residence. As part of this examination, each student must: (a) submit a progress report demonstrating substantive research progress during the first five semesters, (b) submit a plan of research proposed for the remainder of the thesis, (c) present a seminar describing his or her work to the Department. Additional requirements may be imposed in specific areas. See *Section 6 for more details*.

Students may postpone this exam for a limited period owing to scheduling problems, but must request such a postponement in writing to the Graduate Office stating cogently why the exam cannot be taken within the normal time limitation and indicating the scheduled date of the postponed exam. **The desire to perform additional research is not an appropriate reason to defer this review.** Failure to take this exam in the fifth semester will be presumed to indicate unsatisfactory progress in research and constitutes grounds for probation and possible termination.

**8.8 Admission to Candidacy.** A student is recommended for admission to candidacy

for the PhD degree upon satisfactory completion of the fifth-semester review. At this time the appointment of a formal PhD Research Committee is recommended to the Graduate School by the Director of Graduate Studies.

**8.9 Research Committee.** This committee normally includes the Research Advisor as chair, two additional faculty representatives from the Department (usually in the major field), and one faculty representative from a minor field. All members of the committee must be members of the Graduate Faculty and have endorsement to direct doctoral dissertations. Usually, but not necessarily, these committee members are the same as those of the Advisory Committee. The form for **Nomination of Research Committee** and a proposed thesis outline must be accepted by the Graduate School **at least six months** prior to the thesis defense. Once appointed, the Research Committee becomes responsible for monitoring the progress of the student toward the doctoral degree and for conducting the thesis defense.

**8.10 Timeline for Submission of Thesis.** Graduate School regulations state that a student must submit and have received acceptance of the doctoral dissertation within the seven years following admission to candidacy. The Department considers this to be the date of the fifth-semester examination. If the fifth-semester examination is postponed to a later semester, the official date of the candidacy examination will be the last day of classes of the fifth semester of residency. The qualifying examination must be passed at least eight months prior to the date of awarding the degree. Candidacy must be maintained, even when the candidate is not in residence, by enrolling in G901 each semester, or in research credits after the maximum six semesters of C901 have been exhausted. Failure to meet this requirement will automatically terminate enrollment in the degree program

**8.11 Petition for Readmission.** A student whose enrollment in the PhD program has been terminated by failure to meet any of the requirements may petition the Graduate Standards Committee for readmission. This

Petition must be endorsed by at least one faculty member and must state the reasons for the request. The Graduate Standards Committee may grant or deny the request. In cases in which the petition is approved, The Graduate Standards Committee will set a maximum time for completion of the requirement. Approval of the Petition does not imply any further commitment by the Department towards financial support.

**8.12 Steps in Complete of the Doctor of Philosophy Degree.** A checklist showing the timing and responsibility for steps in the attainment of the PhD degree is attached. A potential PhD candidate should refer to this list periodically to make sure all necessary action has been taken. Failure to meet certain deadlines could mean a substantial delay in completion of the degree.

Instructions on electronic submission of the PhD thesis can be found at this web site.

<http://graduate.indiana.edu/theses-dissertations/submission/doctoral.shtml>



## STEPS TO THE DOCTOR OF PHILOSOPHY DEGREE IN CHEMISTRY

<u>Individual or Office Responsible</u>	<u>Step</u>	<u>Timing</u>
1. Student and Graduate Committee	Consultation for program planning	Beginning of first semester
2. Student	Choice of Research Advisor and major field	Ordinarily prior to the start of the second year, preferably as soon as C500 is completed
3. Student in consultation with Advisor	Forms advisory committee	Before beginning of second year
4. Student	Planning of complete coursework program with Advisory Committee	Before beginning of second year
5. Student	Second-Year Requirement - Take required X800 courses	During third and fourth semester
6. Student	Completion of coursework	Preferably by the end of second year
7. Student	Present a research seminar to the Department	Fifth semester
8. Student and Advisory Committee	Fifth-Semester examination; complete, approve & file <b>Nomination of Candidacy &amp; Nomination of Research Committee</b> forms and a 1-2 page summary of thesis proposal	Fifth semester
9. Director of Graduate Studies	Recommends Admission to Candidacy to the Graduate School and PhD Research Committee appointed	Upon completion of all degree requirements other than thesis; at least eight months before degree can be granted
10. Student	Check with Graduate Office on course requirements; see to removal of R and I grades	Early in semester in which student plans to graduate
11. Student	Submit first draft of thesis to Research Advisor	At least six weeks before thesis due in the Graduate School
12. Student and Research Advisor	Submit unbound, revised thesis copies approved by Research Advisor to members of PhD Research Committee	Allow at least one month for committee approval
13. Student and Research Advisor	Arrange exit seminar and final oral examination; after confirming time and date with Committee, notify the Graduate Office; NOTE that student must be registered at the time the degree is granted	At least one month prior to final oral examination and not more than seven years after step 9
14. Student	Make room reservation for exit seminar and oral examination in Chemistry Business Office; complete and file examination announcement (sample available in Thesis Guide) with the Graduate School	At least one month prior to final oral and not more than seven years after step 9

15. Student	After announcement has been signed by Research Advisor submit one copy to the Graduate Office	
16. Student	Present a seminar on dissertation to the Department	
17. Research Advisor	Chair examination, and for successful candidates, obtain signatures of Committee on thesis acceptance sheet and on one copy of 350-word Dissertation Abstract	At time of examination
18. Student	File Dissertation Agreement for a microfilming and copyrighting contract. Pay fees to Bursar and present the receipt to Recorder of the Graduate School. Complete survey of Earned Doctorates and Graduate School exit survey. Also bring a signed thesis acceptance page and a signed thesis Abstract to the Graduate School.	Before degree will be granted. By the 27 <sup>th</sup> of the month the student plans to graduate (except May and December)
19. Student	Make any necessary corrections on all copies of the thesis; Submit dissertation electronically through ProQuest. <b>Have copies bound for Faculty Advisor.</b>	By the 15 <sup>th</sup> of the month the student plans to graduate. (except May & December)
20. President	On recommendation of Dean of the Graduate School	Degree awarded Approximately one month after step 21 (degrees are awarded monthly)

### Summary Timeline for the 5-Year PhD for the Entering Class of 2014

Semester #	Year 2014		2015		2016		2017		2018		2019	
	Fall 1	Spring 2	Summer 3	Fall 4	Spring 5	Summer 6	Fall 7	Spring 8	Summer 9	Fall 10	Spring 10	Summer
Research	C500	C500										
Classes												
2nd Year Requirement												
5th Semester Exam												
PhD Defense												

## 9. THESIS AND FINAL EXAMINATION

**9.1** The thesis is to be written after research has progressed sufficiently to constitute a genuine contribution to science. It must be of such quality that significant portions can be published in one or more of the leading journals in the subject field of research.

The one deadline students need to adhere to is the **PhD defense announcement** that goes to the Graduate School 30 days prior to their defense date. Failure to do so will likely result in the student needing to re-take the exam.

**9.2 First Draft.** A complete copy (*i.e.*, with tables and bibliography) of the first draft should be given to the Research Advisor not less than six weeks prior to the time it is due in the office of the University Graduate School. The Research Advisor will usually require at least two weeks to complete a review of the first draft. Afterwards, extensive rewriting or even additional experimental work may be necessary. From this time until a final draft is ready, it may be necessary to consult with the advisor several times and to modify the developing thesis to achieve a fully satisfactory result. It is always recommended that the student seek advice regarding the writing of the document. Having the document carefully proofread will undoubtedly expedite the review process.

**9.3 Final Draft.** If the comments do not suggest the need for additional experimental work or rewriting, give one copy of the final draft to each member of the PhD Advisory Committee for their evaluation. Each copy must be accompanied by a vita sheet inserted at the end. These should be returned to the student not later than the day of the oral examination. Electronic copies are handled by Proquest and will be placed in the University and Chemistry Department Libraries electronically (See Thesis Guide

<http://graduate.indiana.edu/theses-dissertations/defense.shtml>

The degree will not be awarded until the dissertation has been submitted electronically and Graduate School finalizes it.

**9.4 Departmental Seminar** The candidate must present a departmental seminar on the dissertation prior to the final exam.

**9.5 Final Examination** The final examination constitutes primarily a defense of the thesis, but the PhD Research Committee or any other members of the graduate faculty in attendance may properly ask any question judged by the chair (Research Advisor) to be relevant to the doctorate in chemistry. After the examination has ended, the Research Committee will decide whether or not to accept the thesis and recommend the awarding of the PhD degree.

## 10. OUTSIDE ACTIVITIES, VACATION POLICY, AND PROFESSIONAL BEHAVIOR AND ATTITUDE

**10.1** The guiding rules concerning work at the graduate level and beyond derive from the fact that each student is preparing for a professional career. The progress each student makes in his or her chosen profession will reflect natural aptitude for the field, the quality of training received, and the devotion with which he or she pursues his or her goals. A career in chemistry is a demanding one. Fields change rapidly and professional rewards go to the diligent and well informed. Most individuals find that merely keeping up to date in their own specialties and attending to the routine tasks of their positions is at least a full-time task. It is unlikely that graduate students in the process of learning their field will find it any less time-demanding. Within this framework, both vacations and regular outside interests serve many useful functions. These activities must be viewed in the context of the whole picture; and a balance can be found between these activities of the individual and the professional demands of his or her research program.

**10.2 Vacation policy.** There is no set guideline in the Student Academic Appointment handbook regarding vacation time, and this is generally set by agreement with the student's research advisor. The guiding rule for evaluating what vacation privileges are appropriate is what will fit reasonably into an overall program.

**10.3 Drug free, harassment-free workplace.** Although the lines between academic and personal interactions are often heavily blurred in graduate school, the chemistry department



expects professional behavior in the laboratory that is both compliant with drug-free workplace requirements of the university and funding agencies, and free of harassment. The Student Academic handbook includes the definition of harassment, and where to go if you feel that you are subject to harassment.

[https://www.indiana.edu/~vpfaa/academichandbook/index.php/Main\\_Page](https://www.indiana.edu/~vpfaa/academichandbook/index.php/Main_Page)

## 11. WHEN THINGS GO WRONG

**11.1 Staying on Track.** The 5-year PhD culture is just that – a culture. It involves being aware of deadlines and having a realistic understanding of the Research Advisor's expectations for advancement to candidacy (5<sup>th</sup> semester exam) and defense of the PhD thesis. However, 5 years is a long period of time and sometimes unanticipated changes occur in a student's living situation or in their family, etc. Under such cases, it is important to discuss this change with the research advisor. When this change impacts the typical 5-year PhD timeline, the student is required to discuss this with the Director of Graduate Studies who will re-assess the 5-year plan and provide suggestions for getting back on track or changing the track. E.g., to a 5-6 year track for 5 years + 6 months. Every student's story is different and this is reflected in the actual path that is followed through to successful defense of the PhD thesis.

**11.2 Unanticipated coursework problems.** Students are advised to follow the standard coursework track, but sometimes students are not prepared properly for the graduate-level coursework required for their degree. In this case, the students may be advised to drop the graduate course and take an undergraduate course for remediation purposes. In the event that this realization occurs too late in the semester to add the undergraduate course in concert with dropping the graduate course, students can maintain full-time status with a minimum of 6 credit hours, in accord with the College of Arts and Sciences policy.

**11.3 Change of Major.** Students wishing to change their major after joining the program should get a form from the graduate office to formalize the change.

**11.4 Conflicts with graduate advisor.** Given the important role of the graduate advisor in the career development of the student, conflicts between student and advisor can seem particularly difficult. Students in this situation

are advised to consult a member of their graduate committee or the director of graduate studies to discuss possible means to overcome conflicts or difficulties. If the student feels more comfortable with discussing issues OUTSIDE of the department, Prof. Jane McCleod, Associate Dean for Social Sciences in the College of Arts and Sciences, is the designated associate dean for graduate studies, and can be contacted for consultation.

**11.5 Leave of absence.** If personal illness or other family situations arise during the course of study, students can apply for a leave of absence. Forms can be found at the following links. The Director of Graduate Studies can assist with filling out the forms.

<http://college.indiana.edu/graduate/office/>

<http://college.indiana.edu/graduate/office/leave.shtml>

**11.6 Dismissal from and reinstatement to the program.** There are several reasons a student may be dismissed from a program, including protracted academic probation, failure of the candidacy examination, or destructive behavioral issues. The procedure involved in reinstatement to the program is described in the University Graduate Bulletin, and is as follows.

(1) Obtain the permission of the departmental chairperson, (2) fulfill the departmental requirements in effect at the time of the application for reinstatement, (3) pass the current Ph.D. qualifying examination or its equivalent (defined in advance), and (4) request reinstatement to candidacy from the dean. The reinstatement, if granted, will be valid for a period of three years, during which time the candidate must enroll each semester for a minimum of one credit.

**11.7 Academic Misconduct.** There are many forms of academic misconduct, and the University Office of the Vice Provost for Research provides workshops on how to avoid certain unethical behaviors such as plagiarism and fabrication or falsification of data. Information and resources are available at the following website:

<http://researchadmin.iu.edu/cs-researchint.html>

If you witness cases of academic misconduct, you should report this to your advisor and/or the director of graduate studies, who can take measures to deal with the problem appropriately.

**11.8 Counseling and Psychological Services.** The University offers resources for students having experiences with depression, anxiety, and related conditions. See the following link for available services.

<http://healthcenter.indiana.edu/counseling/>

**11.9 Unsatisfactory performance of AI appointment.** If an AI is not performing up to expectations established by the instructor, this sets in motion the following process:

1. Instructor arranges a face-to-face, one-on-one meeting with the AI to discuss performance issues. The instructor will follow up with an email to the AI, documenting both the reason for the meeting, and any specific plan for improving the situation.
2. The AI's research advisor and the DGS are notified at once of this meeting, for information purposes. The research advisor is encouraged to intervene with the student proactively to correct performance deficiencies.
3. If performance deficiencies persist, the DGS meets with the student to discuss the possibility of dismissal from the AI appointment. The student's advisor is informed of the possibility that support of the student may shift from AI to RA support.
4. Severe cases of misconduct or failure to cooperate in efforts to improve the situation may result in termination of his/her SAA appointment (which includes both AI and RA appointments).
5. If a student is terminated, he/she has 14 days from the written notice of termination to allow time for an appeal in writing. The written appeal must include the reasons why the student feels the termination is unjustified. The College then convenes a hearing board to rule on the appeal.
6. Please see the SAA handbook for the appeal procedures, and other details about student academic appointments (RA and AI).

[https://www.indiana.edu/~vpfaa/academichandbook/index.php/Main\\_Page](https://www.indiana.edu/~vpfaa/academichandbook/index.php/Main_Page)

**APPENDIX I**  
**Second-Year Requirement for Chemistry Ph.D. Students**  
**Policies and Procedures**

Purpose

The goal of the second-year requirement is for students to develop the critical-thinking skills that they need to be effective researchers in their chosen area of study.

Description

Every Ph.D. student in the Department is required to register for a minimum of two semesters prior to their fifth semester of residency in one of the following courses (according to the chosen major area).

Major Area	Course Number
Analytical Chemistry	A800
Chemical Biology	B800
Inorganic Chemistry	N800
Materials Chemistry	M800
Organic Chemistry	R800
Physical Chemistry	P800

Each course is worth one credit hour. Thus each student will earn at least two credit hours from these courses. These credit hours do not count towards the total of 12 credit hours required to satisfy the major coursework requirements, nor do they count towards the total 18 coursework credit hours required for a Ph.D. in chemistry.

Students will be assigned a letter grade for their second-year requirement course at the end of each semester. In some cases a grade of R may be assigned and replaced by a letter grade on completion of the final semester of the course.

The details of the second-year requirement vary depending upon the area of chemistry in which the student is majoring. Specific descriptions for each area are given at the end of this document.

Administration

- Communication to Students
  - All entering Ph.D. students in the Department will be given a copy of this "Policies and Procedures" document during their orientation.
  - During their second semester of residency, students will be reminded of the second-year requirement and they will be instructed to register for the appropriate course.
  - At the end of the required course, students will be sent a statement of whether or not they have satisfied their second-year requirement. Students who have satisfied the requirement will be instructed to make arrangements for their "fifth semester" candidacy exams. Students who have not satisfied the requirement will generally be informed that they must leave the Ph.D. program; it will often be possible for such students to transfer to the M.S. or the M.A.T. degree program.

## Chemistry Ph.D. Second-Year Requirement in Analytical Chemistry

Course Number: A800

Course Title: Analytical Chemistry Research Seminar

Credit Hours: 1 (may not be taken more than twice)

Required Registration: Students majoring in Analytical Chemistry must enroll for A800 during their third and fourth semesters of residency.

Prerequisite: Satisfactory completion of the first-year requirements for graduate study in analytical chemistry or permission of the instructor

Brief Description: Evaluation of second year analytical chemistry students.

### Goals

- (1) To familiarize students with a variety of areas of research in analytical chemistry
- (2) To enhance the abilities of students to read, understand and analyze critically analytical chemistry studies presented in seminars and in the literature
- (3) To maximize the benefit to students of attending analytical chemistry seminars
- (4) To provide students with the opportunity to meet and converse with some of the top scientists in the field of analytical chemistry.

### Format

- (1) The class will meet for one hour each time an external speaker is scheduled to present a seminar in the analytical chemistry series.
- (2) Prior to each class meeting, students will read literature articles written by upcoming analytical chemistry seminar speakers and/or related articles and will prepare questions for speakers based on that preparation.
- (3) At each class meeting, students will pose prepared questions to the visiting speaker and will discuss issues of importance to them and to the field of analytical chemistry.
- (4) ) Students will be required to attend all relevant analytical chemistry seminars.

### Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Quality of preparation for meetings with seminar speakers
- (2) ) Attendance of class meetings and analytical chemistry seminars
- (3) ) ) Participation in class discussions and in seminar series
- (4) Questions asked at analytical chemistry seminars
- (5) ) Written material or examinations as assigned by the instructor

### Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Analytical Chemistry majors are required to pass A800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

## Chemistry Ph.D. Second-Year Requirement in Chemical Biology

Course Number: B800

Course Title: Chemical Biology Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 4 times)

Required Registration: Students majoring in Chemical Biology must enroll for B800 during their third and fourth semesters of residency.

Prerequisite: Satisfactory completion of the first-year requirements for graduate study in chemical biology or permission of the instructor

Brief Description: The preparation and presentation of student research lectures based on current journals and other research literature in chemical biology and related areas not closely related to the student's own research.

### Goals

- (1) To familiarize students with a variety of areas of biochemical literature
- (2) To enhance the abilities of students to read, understand and analyze critically biochemical studies reported in the literature
- (3) To maximize the benefit to students of attending chemical biology seminars
- (4) To provide experience, guidance and critical feedback to students in the organization and oral presentation of literature seminars.

### Format

- (1) The class will meet for one hour a minimum of ten times throughout the semester (or equivalent time).
- (2) ) ) Prior to each class meeting, students will read literature articles written by upcoming biochemistry seminar speakers and/or articles on current topics in biochemistry.
- (3) At each class meeting, one or more student(s) will present a summary of the assigned papers and the class will discuss the reported studies.
- (4) ) ) Students will be required to attend all relevant biochemistry seminars.

### Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Attendance of class meetings and chemical biology seminars
- (2) Quality of literature analysis and presentation thereof
- (3) ) ) Participation in class discussions
- (4) Questions asked at biochemistry seminars
- (5) ) ) Written reports on literature and/or seminars

### Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Chemical Biology majors are required to pass B800 with an average GPA of 3.0 or better over the two semesters. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

### Other Relevant Information

This course will typically be joint listed with Biochemistry Department Course B600.

## Chemistry Ph.D. Second-Year Requirement in Inorganic Chemistry

Course Number: N800

Course Title: Inorganic Chemistry Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 4 times)

Required Registration: Students majoring in Inorganic Chemistry must enroll for N800 during their third and fourth semesters of residency.

Prerequisite: Satisfactory completion of the first-year requirements for graduate study in inorganic chemistry or permission of the instructor

Brief Description: Preparation and presentation of second year inorganic chemistry research project and research proposal.

Goals: Instruction on how to recognize national or local needs which can be advanced by chemistry, then develop creative and original approaches to such needs. Emphasis placed on case studies of past successes in such quests, as well as peer-critiqued presentation and writing of research proposals.

### Format

- (1) Semester 1: Faculty lectures on principles of giving high quality research lectures, as well as principles of writing a research proposal, as distinct from a scientific publication: defense of speculative ideas, as well as conceiving of multiple approaches to a goal, to be strategically prepared for potential problems and the inevitable setbacks towards a goal. To illustrate these principles by historical precedent, student-led oral presentations will be chosen from among approximately recent thematic research topics in inorganic chemistry, with analysis of how the topic developed its goals, approaches and successes. Student presentation of a short research proposal, first orally, with critical comments invited, then transformed into a written research proposal (approx. 8 pages in length).
- (2) Semester 2: Further presentation and analysis of modern inorganic, bioinorganic and materials chemistry research themes, with emphasis on instrumental techniques used for each, as well as the key insights which led to dramatic advances in a given competitive research group. Emphasis on creativity, originality, as well as on the evolutionary character of some discoveries. Drafting, then oral presentation of a larger scope research proposal, on a different topic from semester 1, followed by student criticism, then preparing of a written version, 15 pages in length, to be graded by a class peer as well as faculty.

### Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Quality of both written and oral presentations.
- (2) Active questioning and discussion during class and departmental seminars.

### Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Inorganic Chemistry majors are required to pass N800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.



## Chemistry Ph.D. Second-Year Requirement in Materials Chemistry

Course Number: M800

Course Title: Materials Chemistry Research Seminar

Credit Hours: 1 (may be taken no more than twice)

Required Registration: Students majoring in Materials Chemistry must enroll for M800 during their third and fourth semesters of residency.

Prerequisite: Satisfactory completion of the first-year requirements for graduate study in Materials chemistry or permission of the instructor

Brief Description: Preparation and presentation of student research lectures based on current journals and other research literature in Materials chemistry and related areas on topics not closely related to the student's own research.

### Goals

- (1) To provide experience, guidance and critical feedback to students in the organization and oral presentation of literature seminars
- (2) To familiarize students with a variety of areas of the Materials chemistry literature
- (3) To enhance the abilities of students to read, understand and analyze critically Materials chemistry studies reported in the literature
- (4) To maximize the benefit to students of attending Materials chemistry seminars

### Format

- (1) The class will meet for one hour a minimum of ten times throughout the semester (or equivalent time).
- (2) At each class meeting, one or more student(s) or a faculty member or a visitor will present a seminar on current Materials chemistry research
- (3) Each enrolled student will present one of these seminars, normally during the third semester of residence.
- (4) ) Students will be required to attend all relevant Materials chemistry seminars

### Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Attendance of class meetings and Materials chemistry seminars
- (2) Quality of literature analysis and presentation thereof
- (3) Participation in class discussions

### Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Materials Chemistry majors are required to pass M800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

## Chemistry Ph.D. Second-Year Requirement in Organic Chemistry

Course Number: R800

Course Title: Organic Chemistry Research Seminar

Credit Hours: 1 (may be taken repeatedly up to a maximum of 4 times)

Prerequisite: Satisfactory completion of the first-year requirements for graduate study in organic chemistry, or permission of the instructor.

Brief Description: Major topics in the field of organic chemistry will be examined. A list of subjects will be provided at the beginning of the year.

### Goals

- (1) To familiarize students with topics that are central to the discipline of organic chemistry.
- (2) To encourage and motivate predoctoral students for self-directed learning.
- (3) To develop problem-solving abilities which are considered fundamental skills for scientists in the field of organic chemistry.
- (4) To provide a broad knowledge base which integrates classroom teaching with the research literature.
- (5) To enhance opportunities for students to present the logic of scientific rationale and experimental design in a clearly understood and precise manner.

### Format

- (1) Exams will be based on topics of current literature that have been published in journals featuring organic chemistry as well as classic problems in the field. A random listing of subjects and research journals to be covered will be posted at the beginning of each academic year during the first week of August.
- (2) Exams will be given in the evening of the last Monday of each month during the timeframe of May through November (seven times per calendar year).
- (3) Student exams will be graded as "satisfactory" or "unsatisfactory". Over a two-year period, individuals can attempt 14 cumulative exams.
- (4) ) Students should begin taking these exams in May of their first year of residency and continue throughout their second year and into their third year if necessary. Students, who satisfactorily pass five exams, have completed the course requirement, and need not attempt all 14 exams.

### Grade Assessment

Grades will be based upon the following criteria.

- (1) Students who finish the requirement of five passes in one cumulative exam session (May through November) will receive an A letter grade indicative of an outstanding to excellent overall performance.
- (2) Students who finish the requirement of five passes within the second session (14 attempts) will receive a B letter grade indicative of a good to excellent overall performance.
- (3) Students who fail to achieve five passes in 14 attempts will receive a C letter grade indicative of an unsatisfactory performance.
- (4) ) ) R grades will be posted, prior to completion of the requirement.

### Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Organic Chemistry majors are required to pass R800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

## Chemistry Ph.D. Second-Year Requirement in Physical Chemistry

Course Number: P800

Course Title: Physical Chemistry Research Seminar

Credit Hours: 1 (may be taken no more than 2 times)

Required Registration: Students majoring in Physical Chemistry must enroll for P800 during their third and fourth semesters of residency.

Prerequisite: Satisfactory completion of the first-year requirements for graduate study in physical chemistry or permission of the instructor

Brief Description: Preparation and presentation of student research lectures based on current journals and other research literature in physical chemistry and related areas on topics not closely related to the student's own research.

### Goals

- (1) To provide experience, guidance and critical feedback to students in the organization and oral presentation of literature seminars
- (2) To familiarize students with a variety of areas of the physical chemistry literature
- (3) To enhance the abilities of students to read, understand and analyze critically physical chemistry studies reported in the literature
- (4) To maximize the benefit to students of attending physical chemistry seminars

### Format

- (1) The class will meet for one hour a minimum of ten times throughout the semester (or equivalent time).
- (2) At each class meeting, one or more student(s) or a faculty member or a visitor will present a seminar on current physical chemistry research.
- (3) ) Each enrolled student will present one of these seminars, normally during the third semester of residence.
- (4) Students may additionally prepare more formal presentations or research proposals.
- (5) ) Students will be required to attend all relevant physical chemistry seminars

### Grade Assessment

A letter grade will be assigned at the end of each semester. Grades will be based upon a combination of the following criteria.

- (1) Attendance of class meetings and physical chemistry seminars
- (2) Quality of literature analysis and presentation thereof
- (3) Participation in class discussions

### Criteria for Continuing in the Ph.D. Program

In order to continue in the Ph.D. program, Physical Chemistry majors are required to pass P800 with an average GPA of 3.0 or better. In rare cases, students who do not achieve this criterion may be allowed to continue but will be required to satisfy additional criteria as specified by the Director of Graduate Studies.

## This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

# IMPORTANT CONTACT INFORMATION

## **Name/Address/Number**

Bloomington Police: 220 E. Third Street, 812-339-4477  
Bursar: Poplars Building, rm. W100, 1<sup>st</sup> floor, 812-855-2636  
CAPS: Health Center – 812- 855-7688  
Graduate School: Kirkwood Hall – 111, 812-855-8853  
Graduate Recorder: Kirkwood Hall – 111, 812-855-9345  
International Services: Poplars Building, rm. 221, 2<sup>nd</sup> floor, 812-855-9086  
IU Police: 1469 E. 17<sup>th</sup> St., 855-4111  
Registrar: 408 N. Union Street, 812-855-0121  
Student Inquiries: [scu@indiana.edu](mailto:scu@indiana.edu)

## **Contact Emails**

Arts & Sciences, Dean Jane McLeod: [jmcleod@indiana.edu](mailto:jmcleod@indiana.edu)  
Director of Graduate Studies, Amar Flood: [aflood@indiana.edu](mailto:aflood@indiana.edu)  
Chemistry Chair, David Giedroc: [giedroc@indiana.edu](mailto:giedroc@indiana.edu)  
Chemistry Graduate Office, Toni Lady: [tlady@indiana.edu](mailto:tlady@indiana.edu)  
Chemistry Graduate Office, Dalane Anderson: [dga@indiana.edu](mailto:dga@indiana.edu)

## **Websites**

Arts & Sciences: [www.college.indiana.edu/](http://www.college.indiana.edu/)  
Academic Misconduct: [www.researchadmin.iu.edu/cs-researchint.html](http://www.researchadmin.iu.edu/cs-researchint.html)  
Bursar: [www.bursar.indiana.edu/](http://www.bursar.indiana.edu/)  
Chemistry Department: [www.chem.indiana.edu/](http://www.chem.indiana.edu/)  
Counseling & Psychological Services (CAPS): [www.healthcenter.indiana.edu/counseling/index.shtml](http://www.healthcenter.indiana.edu/counseling/index.shtml)  
Graduate & Professional Student Organization (GPSO): [www.indiana.edu/~gpso/index.php](http://www.indiana.edu/~gpso/index.php)  
Graduate School: [www.indiana.edu/~grdschl/index.php](http://www.indiana.edu/~grdschl/index.php)  
International Services: [www.indiana.edu/~intlsv/](http://www.indiana.edu/~intlsv/)  
IU Bloomington: [www.iub.edu/](http://www.iub.edu/)  
IU Office of Diversity: [www.indiana.edu/~dema/index.shtml](http://www.indiana.edu/~dema/index.shtml)  
Leave of absence: <http://www.college.indiana.edu/graduate/office/leave.shtml>  
NOBCCHE: [www.indiana.edu/~nobcche/](http://www.indiana.edu/~nobcche/)  
OneStart: [www.onestart.iu.edu/](http://www.onestart.iu.edu/)  
Ph.D. & MS Thesis Guide: <http://graduate.indiana.edu/theses-dissertations/defense.shtml>  
Registrar: [www.indiana.edu/~registra/](http://www.indiana.edu/~registra/)

[www.chem.indiana.edu](http://www.chem.indiana.edu)

