Department of Chemistry and Biochemistry

Program Type:\* 

Degree Type:\* 

Chemistry and Biochemistry (PhD)

Provide a brief summary of the proposed program changes and describe the rationale for the change(s):

Removal of Cumulative Examinations: Previously Ph.D. Requirement III

We proposed to do away with the cumulative exam system for our Ph.D. program. Cumulative exams are currently given in the second year, after the completion of graduate courses as a means to judge breath of knowledge in the field. The faculty feels that these exams no longer provide a significant assessment tool for our graduate students. At the stage of cumulative exam administration, students have already demonstrated mastery of the subject material through passing course examinations. For Ph.D. students, we believe that better assessment can be achieved by the addition of a candidacy exam, as described below. We note that the vast majority of peer and aspirant Chemistry and Biochemistry graduate programs in the US have already done away with cumulative exams in favor of a more rigorous candidacy exam similar to what we propose below.

Addition of Candidacy Exam for Ph.D.: Proposed Ph.D. Requirement IV

To replace the cumulative exams for Ph.D. students, we proposed the addition of a formal candidacy examination. Previously, Ph.D. requirements called for a student applying for Ph.D. candidacy to “hold a meeting of the Ph.D. Advisory Committee during the student’s second year in the program, at which time the student will present a brief oral and written outline of his/her proposed research program.” We now proposed to replace this requirement with a formal candidacy examination, with much more specific requirements and a greater level of rigor applied. The proposed process (Ph.D. requirement IV) requires both a detailed 10-page written research proposal and an approximate 45-minute oral presentation on the proposed dissertation research project to the Ph.D. advisory committee. Each part will be graded independently by the committee, and passage of both the oral presentation and written proposal is required for advancement to candidacy. The newly proposed requirement specifies expectations for both the written proposal and the oral examination, including that the applicant demonstrate knowledge related to his or her specific dissertation project and general knowledge of chemistry and biochemistry. There is also an explicit expectation for preliminary research progress, which is to have been accomplished prior to the examination. The Ph.D. advisory committee will provide written feedback summarizing strengths and weakness of the applicant’s preparation. Evaluation criteria, provisions for re-testing upon failure, and an appeals process are also specified. The examination must be completed before the end of the 4th semester of study.

The faculty strongly felt that this new requirement would provide a more rigorous assessment of the applicant’s qualifications for Ph.D. candidacy. In addition, we feel that this process will be more efficient for the student, allowing increased time to focus on dissertation research. Finally, this requirement will add a much-needed writing assessment to our Ph.D. training program, which will provide early feedback and mentorship on scientific writing.

New Specification of Timeline in Forming Ph.D. Advisory Committee

To accommodate the proposed removal of cumulative exams and the new candidacy examination, we proposed to change the specification for the deadline for forming the Ph.D. Advisory Committee to no later than the end of the 3rd semester of study.

Additional Specifications of Ph.D. Advisory Committee Meetings

We propose to add language to the Ph.D. requirements to allow the student to call a Ph.D. Advisory Committee meeting whenever they deem appropriate (Ph.D. Requirement IIIc). This is proposed for the protection of the student in cases where the student may require assistance or advice from committee members other than the Ph.D. supervisor.

We also proposed to add additional requirements that the Ph.D. Advisory Committee must reconvene to assess progress towards the Ph.D. no later than the end of the 11th semester, and annually thereafter (Ph.D. Requirement IV). This proposal is to ensure adequate supervision of the dissertation research project and try to ensure students avoid overly long timelines to the completion of the Ph.D.

Changes to the Departmental Course Requirements

We propose to remove the departmental requirement for Ph.D. students to take two Chemistry and Biochemistry courses “outside of the student’s division,” (Ph.D. Requirement IIIc). The original intent of this proposal was to ensure that Ph.D. students were exposed to a sufficient breath of topics and sub-disciplines during graduate studies. However, the faculty feels that as chemical and biochemical research have become significantly more interdisciplinary, so too has our coursework, making this requirement no longer necessary. The new proposed requirements would still call for completion of six 3-unit courses, and still require adherence to divisional course requirements (see below).

We also propose to remove the wording “with a bachelor’s degree” from the requirement to complete coursework within the first four semesters (Ph.D. Requirement IIIc). We routinely accept new Ph.D. who have completed M.S. degrees in other programs but who are required to complete our coursework as part of their studies at UD. Removal of this clause will remove ambiguity created in this situation.

We propose to remove Chem601 as a course requirement for Teaching Assistants (Appendix C). Over the past several years, we have undertaken significant changes to our department’s new graduate student orientation that occurs before students start the first year of graduate studies. This new model includes significant focus on TA training and pedagogy instruction, which make Chem601 no longer necessary.

Changes to the Divisional Course Requirements (Appendix A)

To reflect the proposed changes in the departmental course requirements, we propose revision of three of our divisional course requirements.

We propose to require students in the Inorganic Division to take at least three courses from the inorganic course sequences (Chem65X or Chem85x). This change is functionally equivalent to the prior requirement, but does not necessitate updating of the document with changes in inorganic graduate course offerings.

We proposed to require students in the Organic Division to work with the designated area faculty advisor(s) to pick the six courses that best fit the research and educational goals of the student. We propose this change as organic chemistry is a particular sub-discipline with a very broad range of applications and specializations – making a “one-size-fits-all” course plan challenging to design. Our prior approach was to require organic chemistry students to take more than the normal course load (seven courses were formally required), but this has created problems in terms of over-taxing students. Furthermore, we often take in students with significant experience in particular areas that outstrip the coverage of the graduate level survey courses, making blanket requirement of the first semester course also undesirable. By allowing students to design their own coursework plan (with the approval of a faculty advisor), we believe that we will create the most efficient and customizable coursework plan for our organic chemistry students.

We propose to replace the departmental “out-of-division” requirement for physical chemistry students with a similar divisional requirement, requiring physical chemistry students to take at least one “out-of-division” graduate course. Physical chemistry provides a foundation for many other areas of chemical research. To ensure that a graduate student in physical chemistry has breadth beyond these areas of physical chemistry, we propose that each student take and pass at least one graduate course in an area of chemistry outside of the traditional physical chemistry courses.

Changes to Departmental Course and Grade Requirements (Appendix B)

We propose to require full-time graduate students in Chemistry and Biochemistry to register for at least nine-credit hours each semester. This is an increase from the minimum of 6-credit hours for students on TA and GA contracts; however, the vast majority of our students have traditionally taken 9-credit hours (even while serving as TAs or GAs) so we do not think it will negatively impact students. We propose this change to ensure adequate progress towards degree and to ensure students have sufficient coursework prior to the proposed Ph.D. candidacy exam.

Occasionally, Chemistry and Biochemistry has part-time graduate students enrolled in the program. We propose to specify that a coursework plan be developed by the student and supervisor, and approved by the director of graduate studies, prior to the start of studies. This will ensure that a reasonable plan for advancement of studies exists prior to the student starting the program.

We propose to clarify the language for the requirement of continuous enrollment prior to and enrollment at graduation. The proposed language has been suggested by The Office of Graduate Studies and Professional Education (OGPE). OGPE has also requested the removal of several other outdated phrases in this section of the document.

Previously, Appendix B quoted the OGPE Academic Probation Policy in full. For ease of maintenance of the graduate guidelines, we propose to remove the quoted text and simply refer to the policy as maintained by OGPE.

We propose to increase our minimum grade requirements by adding a clause that states that in addition to the OGPE Academic Probation Policy, students who earn two or more C+ grades in coursework can be recommended for removal from the program. The faculty believes that often students who struggle with more than one major graduate course lack the preparation to continue in the program, regardless of GPA. The addition of this clause allows the department the ability to recommend these students for removal of the program without further justification.

Other Minor Changes

We propose other minor changes to correct grammar, pronoun usages, typographical errors, and wording clarification. These modifications do not change the substance of the prior guidelines.

 Prospective Curriculum:\*

Requirements for the Degree

Description

A minimum of 30 credit hours of graduate-level courses is required with an overall B average (3.00). The department course requirements are a minimum of eighteen credit hours in graduate level courses (600-level or higher) excluding research and dissertation (CHEM 868 and CHEM 969). At least six three-credit courses must be taken. Specific course requirements for each division are listed below. Scientific courses offered by other Departments may be counted towards the course requirements as courses outside the student's division, if approved by the faculty in the student's division and the Director of Graduate Studies. The student must achieve at least a cumulative grade point average of 3.00 in the courses that fulfill this requirement. The course requirements, including the division's requirements, should be satisfied within four semesters of entering the program.

First year-graduate students are required to take a non-credit one-hour special seminar, CHEM 865-010 (new student seminar). Graduate students must also register for one of the topical seminar series (CHEM 865-XXX - Biochemistry Seminar, Organic/Inorganic Seminar, Physical/Analytical Seminar), as well as Colloquia (CHEM 865-XXX). The PhD degree requires successful completion of a candidacy exam, which includes an oral and written proposal component. The PhD degree requires a thesis based on original research and a final public oral defense of the dissertation.

Specific course requirements by division are outlined below. If a student wishes to take courses other than those specified, then each of these courses must be approved in writing: (a) at the Fall and Spring advisements for first-year graduate students by the representative from the respective Division on the Graduate Curriculum Committee, and (b) at other times by the research advisor.  
  
The remaining courses satisfying the departmental course requirement of 18 credits in graduate level coursework can be selected from offerings in the Department of Chemistry and Biochemistry, or appropriate graduate level courses in other departments.  
  
All students pursuing a degree program in Chemistry and Biochemistry need to secure the written permission from both their research advisor and the Director of Graduate Studies prior to enrolling in any course not bearing a CHEM6XX or CHEM8XX designation.

Analytical Chemistry:

Description

Six credit hours of graduate analytical courses from the list below, plus six additional credit hours of graduate coursework approved by the research advisor.

Courses

CHEM 620 Analytical Spectroscopy (3cr.)

CHEM 621 Chemical Separations (3cr.)

CHEM 622 Electroanalytical Chemistry (3cr.)

CHEM 623 Chemometrics (3cr.)

CHEM 624 Principles of Mass Spectrometry (3cr.)

CHEM 625 Heterogeneous Atmospheric Chemistry (3cr.)

CHEM 628 Chemical Sensors (3cr.)

CHEM 629 Surface Chemistry and Analysis (3cr.)

CHEM 820 Special Topics in Analytical Chemistry (1 to 3cr.)

Biochemistry:

Description

At least nine credits in graduate-level biochemistry courses. CHEM 641 must be taken as one of these courses unless this requirement is waived by the Biochemistry Division. The Division, or the student's research advisor, must approve the courses used to satisfy the Departmental course requirement of 18 credits in graduate level courses. Biochemistry courses that can satisfy these requirements include

Courses

CHEM 641 Biochemistry (3cr.)

CHEM 642 Biochemistry (3cr.)

CHEM 643 Intermediary Metabolism (3cr.)

CHEM 644 Mechanisms of Enzyme Catalysis (3cr.)

CHEM 645 Protein Structure and Function (3cr.)

CHEM 646 DNA-Protein Interactions (3cr.)

CHEM 684 Biochemistry of Nucleic Acids (3cr.)

CHEM 686 Biophysical Chemistry (3cr.)

Inorganic Chemistry:

Description

Inorganic students must take at least nine credits from courses with a CHEM65X or CHEM85X designation, or an equivalent graduate level inorganic course.

Organic Chemistry:

Description

Students in the organic division are free to select coursework that best meets personal educational and professional goals. First year students in the division should consult with the division's representative on the Graduate Curriculum Committee to tailor a course plan that best meets these needs. In general, it is recommended that all organic students take CHEM633 and CHEM634, and at least one additional course (3 credit hours) with a CHEM63X or CHEM83X designation.

Physical Chemistry:

Description

A minimum of three courses from the list below. The student may substitute for one of these three courses from physical-chemistry related three-credit courses upon the approval of the research advisor. Students must take at least one core course in the Department of Chemistry and Biochemistry outside of the Division of Physical Chemistry.

Courses

CHEM 671 Quantum Chemistry (3cr.)

CHEM 672 Advanced Quantum Chemistry (3cr.)

CHEM 674 Chemical Dynamics (3cr.)

CHEM 677 Chemical Thermodynamics (3cr.)

Note:

One may substitute for one of these three courses from related three-credit courses outside physical chemistry upon the approval of the research advisor.

CHEM - 620 - Analytical Spectroscopy (3cr.)

CHEM - 621 - Chemical Separations (3cr.)

CHEM - 622 - Electroanalytical Chemistry (3cr.)

CHEM - 623 - Chemometrics (3cr.)

CHEM - 624 - Principles of Mass Spectrometry (3cr.)

CHEM - 625 - Heterogeneous Atmospheric Chemistry (3cr.)

CHEM - 628 - Chemical Sensors (3cr.)

CHEM - 629 - Surface Chemistry and Analysis (3cr.)

CHEM - 633 - Advanced Organic Chemistry: Physical (3cr.)

CHEM - 634 - Advanced Organic Chemistry: Synthesis and Reactivity (3cr.)

CHEM - 641 - Biochemistry (3cr.)

CHEM - 642 - Biochemistry (3cr.)

CHEM - 643 - Intermediary Metabolism (3cr.)

CHEM - 644 - Mechanisms of Enzyme Catalysis (3cr.)

CHEM - 645 - Protein Structure and Function (3cr.)

CHEM - 646 - DNA-Protein Interactions (3cr.)

CHEM - 651 - Advanced Inorganic Chemistry I (3cr.)

CHEM - 652 - Organometallic Chemistry (3cr.)

CHEM - 653 - Bioinorganic Chemistry (3cr.)

CHEM - 654 - Advanced Inorganic Chemistry II (3cr.)

CHEM - 671 - Quantum Chemistry (3cr.)

CHEM - 672 - Advanced Quantum Chemistry (3cr.)

CHEM - 674 - Chemical Dynamics (3cr.)

CHEM - 677 - Chemical Thermodynamics (3cr.)

CHEM - 678 - Surface Structure and Properties (3cr.)

CHEM - 684 - Biochemistry of Nucleic Acids (3cr.)

CHEM - 686 - Biophysical Chemistry (3cr.)

CHEM - 820 - Special Topics in Analytical Chemistry (1 to 3cr.)