Mission / Purpose

The Chemistry Department has long supported the University's mission. The Department of Chemistry has active research programs in each of the five traditional areas (analytical, biochemistry, biophysical, chemical education, and organic/medicinal) and a bioinformatics option is available in each. Our students have the opportunity to conduct cutting edge research at the interface of chemistry and biology under the guidance of our dynamic faculty. The Department is committed to and has the ability to maintain outstanding facilities to support research efforts. Our goal is to deliver a high quality instructional program at the graduate level to prepare our students for productive careers in academia, industry and government. The emphasis of our graduate program is in the training of scientists.

Goals

G 1: Knowledge of Chemistry

The Department of Chemistry administers a doctoral program designed to endow its graduates with the ability to approach fundamental scientific questions from both a biological and a chemical perspective and to be able to successfully employ scientific methodology to solve real life problems.

Student Learning Outcomes/Objectives

SLO 1: Communication Skill (M: 1, 2)

Students will demonstrate the ability to 1. Communicate effectively in written and oral forms. 2. Read and demonstrate an understanding of scientific literature for content. 3. Critically analyze claims made in the scientific literature. 4. Demonstrate an understanding of scientific terminology. 5. Work effectively in group situations. 6. Students must perform and analyze and be able to relate experiments which address a current problem in the chemical sciences. This is demonstrated in a number of ways and includes oral presentations given during group meetings, poster presentations, and end of semester reports which summarizes research progress using the ACS style research paper guidelines. These guidelines are consistent with the following format: Title:Abstract:Introduction:Experimental Details or Theoretical Analysis:Results:Discussion:Conclusion:References. Our students are also encouraged to attend local, regional, national, and international conferences to present their research through poster and oral presentations.

SLO 2: Critical Thinking (M: 1, 2)

Students will demonstrate the ability to 1. Construct reasonable hypotheses while asking scientific questions. 2. Design and conduct investigations about a variety of chemical problems. 3. Understand and analyze experimental results. Formulate and defend explanations of theory in
chemistry 4. Solve unique problems based on learned factual matter. 5. Effectively perform laboratory experiments. Additionally, students are required to submit an end of semester report on their research which requires the student to formally go through the critical thinking process by providing a detailed analysis of their research (each semester) using the ACS research format. All Ph.D. students are required to submit a dissertation proposal where they provide background and significance of their research, present preliminary data, and propose and develop future experiments to test several hypotheses they propose in their dissertation proposal.

**SLO 3: Technology (M: 2)**

Students will demonstrate the ability to 1. Plan and conduct experiments using top of the line research instrumentation. 2. Use computer and computer graphics for data analysis. 3. Use computers and online resources to access chemical databases. 4. Access chemical literature. 5. Use computer-based software to conduct molecular modeling of chemical structures. 6. Use word processing software applications. 7. Use the internet and online resources. 8. Use state of the art instrumentation in order to solve problems in chemistry.

**SLO 4: Quantitative Skills (M: 1, 2)**

1. Use complex and advanced mathematical models and equations to solve complex problems to understand theory in chemistry, such as, for example, fitting of pH profiles of kinetic isotope effects and quantum mechanical tunneling of hydride ions in enzymatic and chemical reactions. 2. Understand error analysis to validate experimental results. 3. Translate problem situations into symbolic representations for the purpose of solving problems.

**SLO 5: Contemporary Issues (M: 1, 2)**

Students will demonstrate the ability to 1. Know how chemistry can help solve problems in society, for example, how the study of chemical structures and interactions create or solve disease states such as cancer and other diseases. 2. Understand chemical safety and waste control - and their impact on society. 3. Students must perform and analyze experiments which address a current problem in the chemical sciences.

**Measures, Targets, and Findings**

**M 1: Qualifying Exam (O: 1, 2, 4, 5)**

All Ph.D. students must take both a written and an oral qualifying exam within the first two years of enrollment in the program. The written exam is administered using the ACS national exam in the student’s concentration or an equivalent exam. The Department of Chemistry specializes in research in the following chemistry areas: analytical, biochemistry, chemical education, organic/medicinal and computational/physical chemistry. The exam is graded by the faculty on a pass/fail basis based on the achievement of a minimum percentage score (minimum score varies by area of specialization, but no student will pass who scores below the 80th percentile). Once the written exam is complete a committee administers the oral portion of the exam. The oral committee consists of two faculty members from the student’s concentration and one from outside the concentration. The student must give a presentation of his/her research and the committee evaluates the student's expertise and knowledge by asking questions which may be general in nature or very specific and related to the student’s research. If the student passes the oral exam, he/she is advanced to the level of doctorate candidate having passed the General Exam.
Source of Evidence: Writing exam to assure certain proficiency level

**Target for O1: Communication Skill**

The target would be 85% of all PhD students will achieve a score in the 80th percentile or better. Students are advised in their first year of enrollment to take specific core classes in their area of specialization. These core courses are designed to provide the requisite knowledge necessary to continue in advanced research methods and prepares the students for success on the qualifying exam. Additionally, students may elect to take one practice exam before the formal administration of the Qualifying Exam.

**Findings 2012-2013 - Target: Met**

December 2012 and June 2013 Administration of Written Qualifying Exam: 16 students took the exam in December and 3 took the exam in June as retakes (total test takers = 19). Of the 16 December test takers, 2 failed the first attempt of the exam and rescheduled for 6 months (June test takers). December test takers: 16/2 = ~87.5% passed the exam on first try. June test takers: 2/2 = 100% passed on second try.

**Target for O2: Critical Thinking**

The target would be 85% of all PhD students will achieve a score in the 80th percentile or better. Students are advised in their first year of enrollment to take specific core classes in their area of specialization. These core courses are designed to provide the requisite knowledge necessary to continue in advanced research methods and prepares the students for success on the qualifying exam. Additionally, students may elect to take one practice exam before the formal administration of the Qualifying Exam.

**Findings 2012-2013 - Target: Met**

December 2012 and June 2013 Administration of Written Qualifying Exam: 16 students took the exam in December and 3 took the exam in June as retakes (total test takers = 19). Of the 16 December test takers, 2 failed the first attempt of the exam and rescheduled for 6 months (June test takers). December test takers: 16/2 = ~87.5% passed the exam on first try. June test takers: 2/2 = 100% passed on second try.

**Target for O4: Quantitative Skills**

The target would be 85% of all PhD students will achieve a score in the 80th percentile or better. Students are advised in their first year of enrollment to take specific core classes in their area of specialization. These core courses are designed to provide the requisite knowledge necessary to continue in advanced research methods and prepares the students for success on the qualifying exam. Additionally, students may elect to take one practice exam before the formal administration of the Qualifying Exam.

**Findings 2012-2013 - Target: Met**

December 2012 and June 2013 Administration of Written Qualifying Exam: 16 students took the exam in December and 3 took the exam in June as retakes (total test takers = 19). Of the 16 December test takers, 2 failed the first attempt of the exam and rescheduled for 6 months (June test takers). December test takers: 16/2 = ~87.5% passed the exam on first try. June test takers: 2/2 = 100% passed on second try.

**Target for O5: Contemporary Issues**
The target would be 85% of all PhD students will achieve a score in the 80th percentile or better. Students are advised in their first year of enrollment to take specific core classes in their area of specialization. These core courses are designed to provide the requisite knowledge necessary to continue in advanced research methods and prepares the students for success on the qualifying exam. Additionally, students may elect to take one practice exam before the formal administration of the Qualifying Exam.

**Findings 2012-2013 - Target: Met**

December 2012 and June 2013 Administration of Written Qualifying Exam: 16 students took the exam in December and 3 took the exam in June as retakes (total test takers = 19). Of the 16 December test takers, 2 failed the first attempt of the exam and rescheduled for 6 months (June test takers). December test takers: 16/2 = ~87.5% passed the exam on first try. June test takers: 2/2= 100 % passed on second try.

**M 2: Dissertation Defense (O: 1, 2, 3, 4, 5)**

All Ph.D. students are required to write and defend a dissertation of original cutting edge research which they have performed under the direction of a research faculty member.

Source of Evidence: Senior thesis or culminating major project

**Target for O1: Communication Skill**

100% of all PhD students who graduate will write and defend a dissertation successfully. In order to receive the PhD degree, the candidate must undergo a rigorous process of research, literature reviews, and writing before the dissertation defense can be scheduled. Each semester, the student is expected to make satisfactory research progress and under the guidance and at the direction of the research advisor, the candidate will write an updated progress report of his/her research for a grade. Additionally, the final portion of a student's academic work is spent in the laboratory where research is conducted and through weekly group meetings the student must communicate to advisor and peers his/her research. The student must also meet with his/her dissertation committee once each academic year to provide an overview of research project and to report and discuss research progress. When the student schedules the dissertation defense, it is at the approval of the research advisor and dissertation committee.

**Findings 2012-2013 - Target: Met**

12 out of 12 students have successfully defended their dissertation in 2012-2013.

**Target for O2: Critical Thinking**

100% will write and defend a dissertation successfully.

**Findings 2012-2013 - Target: Met**

12 out of 12 students have successfully defended their dissertation in 2012-2013.

**Target for O3: Technology**

100% will successfully write their dissertation following specific college guidelines and will use overhead projectors, computers, and other equipment during the dissertation defense presentation.
Findings 2012-2013 - Target: Met
12 out of 12 students have successfully defended their dissertation in 2012-2013.

Target for O4: Quantitative Skills
Ability to perform analyses on chemical data (i.e., such as chemical reactivity, solubility, molecular weight, melting point, radiative properties) and to apply that analyses to real life problems. Must develop skill at using modern computer and communication techniques applied to chemistry. Write technical papers or reports Work with research advisor to conduct analyses of research projects, interpret test results, or develop nonstandard tests.

Findings 2012-2013 - Target: Met
All PhD students will be required to submit technical reports at the end of each semester that provide a technical summary of research findings. 100% of all actively enrolled students met this requirement in 2012-2013 each semester.

Target for O5: Contemporary Issues
All PhD students are encouraged

Details of Action Plans for This Cycle (by Established cycle, then alpha)

Continued Quality
Our goal is to continue excellence with our program’s growth.
- Established in Cycle: 2005-2006
- Implementation Status: Planned
- Priority: High
- Implementation Description: Fall 12
- Responsible Person/Group: Giovanni Gadda, Ph.D.

Continued Quality and Growth
The department has met all its goals and will continue to grow while keeping the quality of the program.
- Established in Cycle: 2006-2007
- Implementation Status: Planned
- Priority: High
- Responsible Person/Group: Giovanni Gadda, Ph.D.

Action Plan
The PhD program meets all our objectives. Our plan is to continue this excellence with continued growth.
- Established in Cycle: 2009-2010
- Implementation Status: Planned
- Priority: High