Degree Program Assessment Plan

Degree Program - AS - Chemistry (PHD)

CIP Code: 40.0501.00
Disciplinary Accrediting Body: American Chemical Society
Next Program Review: 14-15
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Student Learning Outcome: knowledge of chemical principles and research

To demonstrate advanced knowledge of chemical principles and current scientific research in chemistry.

Outcome Status: Active
Outcome Type: Student Learning
Start Date: 06/15/2015

Assessment Methods

Diagnostic examinations.
Before entering students register for classes they are given a series of nationallynormalized examinations provided by the American Chemical Society. If deficiencies in the student's area of specialization are apparent, students are advised to take coursework or engage in guided independent study during their initial semester of graduate school. They are then given a second opportunity to pass the exam covering their area of specialization at the beginning of their second semester of study.

Criterion: Two chances to pass at least one out of three diagnostic exams, where the “pass” rate is set by the individual divisions, but must be at least the 50th national percentile.

Cumulative examinations.
PhD students must take a series of written cumulative examinations in their specialty area covering a wide spectrum of material, with the purpose of assessing the student's ability to use the array of knowledge obtained from graduate coursework to analyze complex chemical problems. These exams must be passed in order to be admitted to candidacy.

Criterion: Pass one exam after 6 chances in the first year; pass four exams total after 12 chances total in the second year.

Seminar course.
Students must enroll in the CHEM 5101/5102 seminar courses for at least four semesters. Students enrolled in these classes must attend weekly divisional seminars presented by TTU faculty and students, and guest lecturers from other institutions, that cover topics in their area of specialization. Students also attend weekly departmental seminars that cover a wide range of topics and feature national and international speakers. More advanced students no longer enrolled in CHEM 5101/5102 are still expected to attend seminars, assessed by their research advisors via CHEM 7000 (research).

Criterion: Grade of A or B in CHEM 5101/5102 and CHEM 7000.
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**Student Learning Outcome: conduct research**

To be able to effectively conduct and design original, in-depth, scientific research in chemistry.

**Outcome Status:** Active  
**Outcome Type:** Student Learning  
**Start Date:** 06/15/2015

**Assessment Methods**

Research and future work examination.  
The research and future work examination allows the student to orally discuss the research project in its early stages, via a 30-45 minute presentation and Q&A with the student’s committee. This exam must be passed in order to be admitted to candidacy.  
(Active)

**Criterion:** The research and future work examination involves both a written and oral component, which must adhere to guidelines published in the graduate handbook. The determination is made by committee members.

Ph.D. dissertation defense.  
The PhD dissertation defense requirement again affords the opportunity to present the research project to the committee, this time at the end of the project.  
(Active)

**Criterion:** The Ph.D. dissertation defense involves both a written and oral component, which must adhere to guidelines published in the graduate handbook. The determination is made by committee members.

CHEM 7000 (research) course.  
This learning outcome is assessed during the course of the research project by the research advisor’s determination of the CHEM 7000 grade at the end of each semester.  
(Active)

**Criterion:** Grade of A or B in CHEM 7000.

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**Student Learning Outcome: oral and written communication**

To be able to effectively communicate, both orally and in writing, the results of new and advanced scientific research in chemistry.

**Outcome Status:** Active  
**Outcome Type:** Student Learning  
**Start Date:** 06/15/2015

**Assessment Methods**

Literature seminar. 
The literature seminar is presented to the entire chemistry division to which the student belongs, as part of the weekly seminar
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Criterion: The literature seminar must adhere to guidelines published in the graduate handbook. The determination is made by the set of faculty who attended the seminar.

Research and future work examination.
The research and future work examination allows the student to discuss the research project in its early stages, via a written paper, followed by a 30-45 minute presentation and Q&A with the student's committee. This exam must be passed in order to be admitted to candidacy. (Active)

Criterion: The research and future work examination involves both a written and oral component, which must adhere to guidelines published in the graduate handbook. The determination is made by committee members.

Ph.D. dissertation defense.
The PhD dissertation defense requirement again affords the opportunity to present the research project to the committee, this time at the end of the project.

Criterion: The Ph.D. dissertation defense must adhere to guidelines published in the graduate handbook. The determination is made by committee members.

Effective written communication is also thoroughly assessed in the student's Ph.D. dissertation itself, by the Ph.D. committee members, at least one week prior to the oral dissertation defense. Suggestions for improving the written dissertation can continue even after the oral presentation.

Criterion: The Ph.D. dissertation must adhere to guidelines published in the graduate handbook. The determination is made by committee members.

Scientific Writing Course. Students are encouraged to take a 1 credit hour special topics course, offered by the department, on scientific writing, with the specific goal of writing a research paper for submission to a scientific journal. (Active)

Student Learning Outcome: safety and ethics

To demonstrate a working understanding of chemical research safety, ethics, and responsible conduct (RCR).

Outcome Status: Active
Outcome Type: Student Learning
Start Date: 06/15/2015

Assessment Methods

Laboratory safety certification.
All PhD students must be safety certified through the TTU Environmental Health and Safety unit, before joining a research group and entering their laboratories.

Criterion: The EH&S on-line course on laboratory safety contains a quiz. 16 out of 20 questions (80%) have to be answered correctly to pass the course.

Research ethics course.
All PhD students are required to enroll in a for-credit course addressing scientific research ethics, CHEM 5104.
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<th>Criterion</th>
<th>Learning success determined via short quizzes (20%), homework (40%), case studies (20%), and a presentation (20%).</th>
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Federal grant compliant RCR certification. All PhD students who receive federal grant support must receive training and certification in the responsible conduct of research (RCR).

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<th>Criterion</th>
<th>Successful completion of CHEM 5104, in addition to various training and guidance opportunities offered by the TTU Office of Research Integrity.</th>
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