

Detailed Assessment Report
2010-2011 Polymer Science and Engineering MS

Mission/Purpose

The M.S. of Polymer Science in the School of Polymers and High Performance Materials is designed as a rigorous curriculum that will be the best possible preparation for employment in the polymer and materials scientific workforce or for entry into appropriate doctoral programs, such as Polymer Science and Engineering, Chemistry or Chemical Engineering.

Student Learning Outcomes, with Any Associations and Related Measures, Achievement Targets, Findings, and Action Plans

O 1: Understand and conceptualize the polymerization

Students will be able to understand the theory of polymerization, to conceptualize and be able to analyze and contrast and compare different polymerization types and to apply this knowledge and understanding at an advanced level to the design of reaction schemes for hypothetical monomers and polymers.

Related Measures:

M 3: Comprehensive Exam

Students will demonstrate sufficient knowledge of polymer chemistry as measured by a comprehensive examination given by the polymer science faculty. 80% of students will be able to correctly write and/or identify reaction mechanisms on their first test attempt.

Achievement Target:

80% of students will be able to correctly write and/or identify reaction mechanisms on their first test attempt.

Findings (2010-2011) - Achievement Target: Met

Fall 2010-- 100% (1 of 1) of MS students correctly identified reaction mechanisms of their first test attempt. Spring 2011--91% (10 of 11) correctly identified reaction mechanisms of their first test attempt.

M 4: Self-evaluation

A student self-efficacy questionnaire will be given to all students at the completion of the sequence PSC 701 (Organic Polymer Chemistry I), PSC 702 (Organic Polymer Chemistry II), and PSC 703 (Organic Polymer Chemistry III). Upon completing these courses, 80% of students will agree that the organic chemistry core adequately prepared them with a basic understanding of polymer chemistry.

Achievement Target:

80% of students will agree that the organic chemistry core adequately prepared them with a basic understanding of polymer chemistry.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--data acquired in Spring 2011--100% of eligible students responding to questionnaire (2 out of 2) agreed that they were adequately prepared with a basic

understanding of polymer chemistry by responding with a `4` (agree) or `5` (strongly agree).

O 2: Understand nature and polymer chain conformation

Students will understand the nature and importance of polymer chain conformation, solution thermodynamics, phase equilibrium and transport phenomena.

Related Measures:

M 5: Comprehensive Exam

Students will demonstrate their ability to conceptualize in Polymer physics and physical Chemistry in a comprehensive examination given by the Polymer Science faculty. 80% of students will be able to correctly identify and use proper standard equations and identify physical properties from data provided.

Achievement Target:

80% of students will be able to correctly identify and use proper standard equations and identify physical properties from data provided.

Findings (2010-2011) - Achievement Target: **Met**

Fall 2010--100% (1 of 1) student correctly identified and used standard equations and identified physical properties from data provided. Spring 2011--100% (11 of 11) students correctly identified and used standard equations and identified physical properties from data provided.

M 6: Self-evaluation

The importance of conceptualizing in polymer physics will be evaluated by student questionnaire of all Masters students at the time of their dissertation. At least 75% of the students will agree that the ability to think conceptually about polymer physics is an essential skill for problem-solving in polymer science.

Achievement Target:

75% of the students will agree that the ability to think conceptually about polymer physics is an essential skill for problem-solving in polymer science.

Findings (2010-2011) - Achievement Target: **Met**

Fall 2010-questionnaire given in Spring 2011--100% of responding students (11 of 11) agreed that the ability to think conceptually about polymer physics is an essential skill for problem-solving in polymer science by responding with a `4` (Important) or `5` (very important).

O 3: Conduct research in the field

Students will demonstrate their ability to conduct research in polymer science.

Related Measures:

M 1: External Evaluations

Senior-level polymer scientists from industry, academia and national laboratories frequently visit and tour our facility. All will be asked to evaluate our working environment for safety. We expect only minor infractions and we will act to rectify these. Our goal is to have 95% of visitors to

declare that Polymer Science students demonstrate a conscious awareness of safety and operate in a safe manner.

Achievement Target:

95% of visitors to declare that Polymer Science students demonstrate a conscious awareness of safety and operate in a safe manner.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100% of qualified visitors stated that the science labs are operated in safe manner. Spring 2011--100% of qualified visitors stated that the science labs are operated in safe manner.

M 2: Public Forum Presentation

Masters students will demonstrate the ability to communicate their research by having their work accepted for public presentation at a regional, national, or international scientific conference within one year of graduation.

Achievement Target:

50% of the Masters students will demonstrate the ability to communicate their research by having their work accepted for public presentation at a regional, national, or international scientific conference within one year of graduation.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100% (1 of 1) of graduating MS students had their work accepted for public presentation. Spring 2011--100% (1 of 1) of graduating MS students had their work accepted for public presentation.

M 7: Research Project

80% of the students will complete an original research project and produce a thesis which is evaluated as satisfactory or better by the students' committees.

Achievement Target:

80% of the students will complete an original research project and produce a thesis which is evaluated as satisfactory or better by the students' committees.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100%(1of 1) of MS graduates completed a thesis considered satisfactory or better by the students` committees. Spring 2011--100%(1of 1) of MS graduates completed a thesis considered satisfactory or better by the students` committees

M 8: Alumni Survey

Alumni will be surveyed and at least 80% of respondents will agree that the MS program provided them with the necessary conceptual skills and tools to conduct original research.

Achievement Target:

80% of respondents will agree that the MS program provided them with the necessary conceptual skills and tools to conduct original research.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--survey given in the Spring 2011--100% of alumni respondents (2 of 2) agreed that the MS program provided them with necessary conceptual skills and tools to conduct

original research by answering the above question by marking as either 4 - "agree" or 5 - "strongly agree"

M 9: Thesis

Master's students will produce a thesis that is rated satisfactory or better by their advisory committee and they will successfully defend this thesis by public oral presentation to the satisfaction of their committee.

Achievement Target:

80% of Master's students will produce a thesis that is rated satisfactory or better by their advisory committee and they will successfully defend this thesis by public oral presentation to the satisfaction of their committee at their first attempt.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100%(1 of 1) of MS graduates produced and orally defended a thesis that is rated satisfactory or better by their advisory committee Spring 2011--100%(1 of 1) of MS graduates produced and orally defended a thesis that is rated satisfactory or better by their advisory committee

M 10: Laboratory Safety Skills Assessment

Upon completion of the safety course, PSC 510 (Safety Principles and Procedures in the Chemical Sciences), the students will be evaluated by the college safety officer. All students will demonstrate the necessary skills and awareness of safe working procedures. No student will be allowed to conduct laboratory research until they have been deemed safe by the college safety officer.

Achievement Target:

90% of students pass the evaluation on their first attempt.

Findings (2010-2011) - Achievement Target: Met

Fall 2010-100% of students (10 of 10) passed the safety evaluation

O 4: Communicate results in written and oral formats

Students will demonstrate the ability to communicate the results of their research in written and oral format.

Related Measures:

M 2: Public Forum Presentation

Masters students will demonstrate the ability to communicate their research by having their work accepted for public presentation at a regional, national, or international scientific conference within one year of graduation.

Achievement Target:

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Achievement Target:

80% of students will be able to correctly identify and use proper standard equations and identify physical properties from data provided.

Findings (2010-2011) - Achievement Target: Met

Fall 2010--100% (1 of 1) student correctly identified and used standard equations and identified physical properties from data provided. Spring 2011--100% (11 of 11) students correctly identified and used standard equations and identified physical properties from data provided.

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O 5: Skills to work safely in a laboratory environment

The students will have the skills and knowledge to safely work in a laboratory environment.

Related Measures:

M 1: External Evaluations

Senior-level polymer scientists from industry, academia and national laboratories frequently visit and tour our facility. All will be asked to evaluate our working environment for safety. We expect only minor infractions and we will act to rectify these. Our goal is to have 95% of visitors to declare that Polymer Science students demonstrate a conscious awareness of safety and operate in a safe manner.

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Achievement Target:

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Findings (2010-2011) - Achievement Target: Met

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

Emphasize organic reaction mechanisms

More emphasis will be placed on the fundamentals of organic mechanisms during the first semester coursework to increase student ability in this area.

Established in Cycle: 2007-2008

Implementation Status: In-Progress

Priority: Medium

Implementation Description: Fall semester 2009

Responsible Person/Group: graduate teaching faculty

Analysis Answers

What specifically did your assessments show regarding proven strengths or progress you made on outcomes/objectives?

Visitors to the School of Polymers and High Performance Materials continue to praise the School's efforts to educate our students on safety protocols. The necessity of that education was recently reinforced to our student by career consults working for the American Chemical Society. The consultants told our students that the number one topic that is desired but not incorporated in most graduate students is a knowledge of laboratory safety. Safety is an important item that is taught primarily informally, even though students do take a safety course. The School of Polymers engages students in the safety procedures by holding regular safety meetings of group safety leaders, as well as a safety seminar each semester.

What specifically did your assessments show regarding any outcomes/objectives that will require continued attention?

Responses to the alumni survey are very weak among the selected cohorts, so much so that answers are not a true measure. The School of Polymers will monitor the situation closely, as the number of MS graduates is already low relative to the BS or PhD programs so a higher percentage of graduates is needed to respond to surveys. The faculty will continue to encourage former students to maintain contact and return surveys when asked.

Annual Reports

Program Summary

During the 2010-2011 assessment cycle, the School of Polymers and High Performance Materials (SPHPM) has continued to strive to meet goals set forth by the University, especially in the area of being a premier research university. The SPHPM is a research focused program at all educational levels. The research conducted by the faculty and students is internationally respected and renowned, as evidenced by the number of publications and invited presentations given each year (over approximately 50 in each category for the previous calendar year). The faculty have increased their effort spent in outreach activities, including Dr. Daniel Savin participating in the National Kids Science Challenge and Dr. Robert Lochhead appearing in several videos related to efforts to help clean the BP oil spill, most notably for National Geographic. Dr. Derek Patton was recently awarded a National Science Foundation Career award, a prestigious grant that allows Dr. Patton to work with several students at all levels on cutting edge ideas. The MS program in Polymer Science continues to serve primarily as a "step-through" program for students wishing to obtain their PhD directly from a BS program. This being the case, the numbers of MS graduates will stay low in the School of Polymers and High Performance Materials for the time being.

Continuous Improvement Initiatives

The School of Polymers and High Performance Materials will continue to seek new avenues of funding that enhance the student experience and provide greater opportunities for learning for our students. Recently, more attention has been paid to those students who are considering a career in academia at any level by pursuing grants such as the National Science Foundation GK-12 program, which sends graduate students to local grade schools in order to experience teaching at the K-12 levels. The current MS program is often viewed as a step-through program to the PhD in polymer science. However, more attention is being given to students who wish to obtain a M.S. Strategies for increasing the number of students graduating with a MS in polymer science are currently being investigated by the School.

Closing the Loop

New course offerings have been developed that are available as electives for graduate students in the School of Polymers and High Performance Materials, such as a composites course, a molecular modeling course, and a scattering course, that address needs for students with advanced polymer science and engineering degrees to be versed in these topics. In particular, composites and molecular modeling were recommended by employers who were hiring our students into the composites industry for internships and full-time work, such as GE Aviation, Boeing, and Northrop Grumman/Ingalls. These two courses have been met with enthusiastic approval by our current students, who believe that these related areas are an important part of their potential career paths.