Expected Outcomes: 1. Comprehensive Chemical Engineering Knowledge

Our graduates will demonstrate a thorough understanding of the principles, sciences, and technologies that are broadly associated with the area of chemical engineering.

Assessment methods

Method: 1a. PhD qualifying examination (Graduate Core Course Component)

Every Ph.D. student is required to pass our PhD qualifying examination. Note: The PhD qualifying examination consists of two parts: 1) the graduate core courses described below, and 2) the general oral exam (or prelim) which focuses on the students’ research work.

The PhD Qualifying Examination is partially fulfilled by earning a B or higher in each of the four (4) core graduate courses consisting of: CHEN 7100 (Transport Phenomena), CHEN 7110 (Chemical Engineering Analysis/Advanced Transport), CHEN 7200 (Chemical Engineering Thermodynamics) and CHEN 7250 (Chemical Reaction Engineering). We define a B grade as “minimum competency of a PhD candidate” and as such it is not defined by a rigid numerical value. PhD students are required to take these courses as soon as possible after matriculation into the program.

Target level: We expect that our students’ success rate should be 60% or better in the first attempt of the courses.

Findings:
12 Ph.D. students were part of the Fall 2013 class. Out of these 10 students (or 83%) passed the graduate core course component of the qualifying examination in the first attempt during this assessment period.

How did you use findings for improvement?

The Graduate Program Committee has communicated these results to the faculty as well as other stakeholders. We will continue to look for opportunities to improve the program and the learning experience for the students. By requiring that a grade of B or higher in the core courses be obtained by every Ph.D. student that continues in our program, we ensure that every Ph.D. student has demonstrated a thorough understanding of the principles, sciences, and technologies that are broadly associated with the area of chemical engineering. The areas where students struggled were generally related to either language problems, or difficulties in math and problem visualization.

Additional comments:
None

Method: 1b. Chemical Engineering Knowledge-Student Survey

Upon completion of the degree requirements for the Ph.D. in Chemical Engineering, each student will be asked to fill out a graduation survey covering several items including the following question: To what degree did your Ph.D. chemical engineering education provide you with a thorough understanding of the principles, sciences, and technologies that are broadly associated with the area of chemical engineering?

Target level: We expect that our students’ responses should average a score of 4 or better out of 7
on this question.

Findings:

10 students completed their Ph.D. degree in chemical engineering during this evaluation period. These students responded to the following question using this response key. Response Key 1 – Very Poor, 2 – Poor, 3 – Fair, 4 – Good, 5 – Very Good, 6 – Excellent, 7 – Exceptional:

To what degree did your Ph.D. chemical engineering education provide you with a thorough understanding of the principles, sciences, and technologies that are broadly associated with the area of chemical engineering? (Average Score 5.8)

The average score on this survey question was greater than the anticipated score of 4.0.

How did you use findings for improvement?

The average scores on the above survey question exceeded the anticipated level of performance. Therefore, no action will be taken at this time and this method of assessment will be continued for all Ph.D. students during the next evaluation period.

Additional comments:

None
Expected Outcomes: 2. Creative and Independent Research

Our graduates will demonstrate an ability to undertake focused study and advanced creative and independent research of a significant unsolved problem, such as the development of new theoretical methodologies, experimental techniques, or significant advances in knowledge and understanding of the discipline of chemical engineering.

Assessment methods

Method: 2a. Research Expertise-Faculty Survey

To fulfill degree requirements for the Ph.D. in Chemical Engineering a Ph.D. candidate must have a Dissertation of their research work approved by their graduate committee (typically made up of three faculty within Chemical Engineering, an outside committee member and an outside reader appointed by the Graduate School) and must successfully defend this Dissertation in an oral defense. During the oral defense of the students research work, a standardized form will be completed by all members of the committee dealing with various issues including: ability of the student to undertake focused study, creativity of the students research, independence of the students research, significance of the problem addressed. The student’s performance in each of these areas will be ranked on the standardized assessment form as Excellent (3pts), Acceptable (2pts), or Unacceptable (1pt).

Target level: We anticipate that the average score of our students in each category will be 2.0 or higher.

Findings:

10 students completed their Ph.D. degree in chemical engineering during this evaluation period. These students’ committee members responded to the following questions regarding the students performance. 23 faculty responses were collected in total from the student defenses. The committee members scored their answers as Excellent (3pts), Acceptable (2pts), or Unacceptable (1pt). Average Score Question 2.8

Please evaluate the student’s ability to undertake focused study. 2.8

Please evaluate the creativity of the student’s research. (Average Score 2.8)

Please evaluate the independence of the student’s research. (Average Score 2.9)

Please evaluate the significance of the problem addressed in the student’s research. (Average Score 2.9)

The average scores on these four survey questions were greater than the anticipated score of 2.0

How did you use findings for improvement?

The average scores on the above survey questions exceeded the anticipated level of performance. More data will be collected to evaluate this outcome. Therefore, no action will be taken at this time and this method of assessment will be continued for all Ph.D. students during the next evaluation period

Additional comments:

None
Method: 2b. Research Expertise-Student Survey

Upon completion of the degree requirements for the Ph.D. in Chemical Engineering, each student will be asked to fill out a graduation survey covering several items including the following question: To what degree did your Ph.D. chemical engineering education enhance your ability to undertake focused study? To what degree did your Ph.D. chemical engineering education enhance your ability to undertake creative research? To what degree did your Ph.D. chemical engineering education enhance your ability to perform independent research?

Target level: We expect that our student's responses should average a score of 4 or better out of 7 on this question.

Findings:

10 students completed their Ph.D. degree in chemical engineering during this evaluation period. These students responded to the following questions using this response key. Response Key 1 – Very Poor, 2 – Poor, 3 – Fair, 4 – Good, 5 – Very Good, 6 – Excellent, 7 – Exceptional

To what degree did your Ph.D. chemical engineering education enhance your ability to undertake focused study? (Average Score 6.1)

To what degree did your Ph.D. chemical engineering education enhance your ability to undertake creative research? (Average Score 6.4)

To what degree did your Ph.D. chemical engineering education enhance your ability to perform independent research? (Average Score 5.9)

The average scores on these survey questions were greater than the anticipated score of 4.0

How did you use findings for improvement?

The average scores on the above survey question exceeded the anticipated level of performance. Therefore, no action will be taken at this time and this method of assessment will be continued for all Ph.D. students during the next evaluation period.

Additional comments:

None
Expected Outcomes: 3. Communications Skills

Our students will demonstrate proficiency in their communication skills through completion of a Doctoral Dissertation on the research topic, an Oral Defense of that Dissertation, and through scholarly publications in the open literature and through presentations to professional audiences.

Assessment methods

**Method: 3a. Communications Skills-Faculty Survey**

To fulfill degree requirements for the Ph.D. in Chemical Engineering the candidate must have a written Dissertation of their research work approved by their graduate committee and must successfully defend this Dissertation in an oral defense. After the defense, a standardized form will be completed by all members of the committee dealing with various issues including; clarity of the written document, organization and logic of the written document, ability of the student to communicate technical ideas within the written document, clarity of the oral presentation, organization and logic of the oral presentation, and the ability of the student to communicate technical ideal in the oral presentation. The students performance in each of these areas will be ranked on the standardized assessment form as Excellent (3pts), Acceptable (2pts), or Unacceptable (1pt).

**Target level:** We anticipate that the average score of our students in each category will be 2.0 or higher.

**Findings:**

10 students completed their Ph.D. degree in chemical engineering during this evaluation period. These students' committee members responded to the following questions regarding the students performance. 28 faculty responses were collected in total from the student defenses. The committee members scored their answers as Excellent (3pts), Acceptable (2pts), or Unacceptable (1pt).

Please evaluate the student’s written document in terms of it’s clarity, organization and logic, and the ability of the student to communicate technical ideas in this written form. *(Average Score 2.8)*

2.8 Please evaluate the student’s oral defense in terms of the clarity of the oral presentation, organization and logic of the presentation and the ability of the student to communicate technical ideas orally. *(Average Score 2.8)*

The average scores on these two survey questions were greater than the anticipated score of 2.0

**How did you use findings for improvement?**

The average scores on the above survey questions exceeded the anticipated level of performance. Therefore, no action will be taken at this time and this method of assessment will be continued for all Ph.D. students during the next evaluation period.

**Additional comments:**

None
Method: 3b. Publications and Presentations

Students in the Ph.D. program in Chemical Engineering are expected to communicate their research work to the scientific community through scholarly publications in the open literature and through presentations to professional audiences. Data on the number of publications and presentations by each graduate of the program will be collected and reviewed.

Target level: We anticipate that the average number of publications per Ph.D. graduate in our program will be 2 or more. We also anticipate that the average number of presentations to professional audiences per Ph.D. graduate will be 1 or more.

Findings:

Data was collected on the number of publications and presentations by each graduate who completed their Ph.D. during this evaluation period as follows.

Average Number of Publications = 4.8
Average Number of Presentations = 8.5

How did you use findings for improvement?

The anticipated goal of the average number of publications of 2 or more was met by the students. We will continue to encourage our Ph.D. students to have a high number of publications so that each graduate will continue to meet and exceed this anticipated goal. The anticipated goal of the average number of presentations to professional audiences of 1 or more was met. In addition, every student met this goal. However, we will strongly encourage our Ph.D. students to increase this number of presentations so that each graduate might exceed this anticipated value in the future. This method of assessment will be continued for all Ph.D. students during the next evaluation period.

Additional comments:

None