Chemical Engineering, Undergraduate, BSCH, Tampa

Assessment Cycle: 2019 Reporting

Overall Review: Report Approved   COMPLIANT

Mission Statement

The mission of the Department of Chemical Engineering is to prepare graduates with fundamental knowledge and contemporary skills for the development, economic design, and safe operation of chemical and biological systems, processes, products, and methods in a manner compatible with societal values.

Goal 1: Discipline-Specific Knowledge

Students will develop Discipline Specific Knowledge and Skills.

1a. Student Learning Outcome Statement

Audit Review: AC

Graduates of this program will demonstrate an ability to identify, formulate, and solve engineering problems (cf. ABET Outcome 1)

1b. Method of Assessment

Audit Review: AC

- All students in the program are required to take a capstone design course. This is a semester long project at the end of which the students will be asked to submit a comprehensive written and oral report. This report will be assessed by a committee consisting of faculty, teaching assistants and members of the Departmental Industrial Advisory Board. They will be asked to rate the report using the following rubric.
- 1: Poor. The report does not demonstrate an ability to identify and solve engineering problems. No evidence of problem solving ability was shown.
- 2. Fair. The report demonstrates only a rudimentary ability to identify and solve engineering problems. While they are able to identify the problem, they do not clearly show how to solve it using knowledge gained in the curriculum.
- 3. Good. The report demonstrates reasonable proficiency in engineering problem solving. They are able to identify and then give a solution based on their engineering skills and knowledge.
- 4. Very Good. The students show good proficiency in engineering problem solving. They are able to demonstrate how to identify the problem, formulate a problem solving strategy and then execute it.
- 5. Excellent. The students demonstrate excellent ability to solve engineering problems. They are able to articulate the problem, identify solution methods and algorithms and then execute it to find an acceptable solution to the problem. The methodology is technically accurate.

To *ensure reliability of the assessment instrument for this outcome, the members of the Departmental Graduate Committee reviews the rubric periodically and recommends revisions if necessary."*

After the ratings are compiled an average rating is computed based on the average ratings from faculty, teaching assistants and advisory board members.

The departmental Undergraduate Committee then reviews these ratings and makes recommendations for program changes as needed.

1c. Performance Targets

Audit Review: AC

The ratings of the faculty, Teaching Assistants and members of the Industrial Advisory Board would be collected and averaged. The performance target is to achieve an average rating of 4.0 or above for the class as a whole. The average rating the Instructor is also expected to be 4.00 or above. An average below 4.00 would require the faculty to consider remedial actions.

1d. Assessment Results

Audit Review: AC

At the end of the Spring semester, the Undergraduate Industrial Advisory Board gathered with faculty and teaching assistants to review the Capstone Design Course Posters prepared by the students in the Senior Design Course. There were 24 posters presented by student groups. Each poster was judged by 3 teams of judges. The results were as follows:
Average Advisory Board Ratings: 4.06
Average Faculty Ratings:4.05
Average TA Ratings: 4.02
Overall average: 4.04

1e. Use of Assessment Results

Audit Review: AC

Use of Assessment results 1e:
The Assessment Results from spring 2019 were presented to the Departmental Assessment Committee, the Industrial Advisory Board, and the

Departmental Faculty who discussed these and other findings. Based on these results, it was recommended that while the ratings from capstone design evaluation were 4.0 or more in the Outcome 1a category, changes in the curriculum should be pursued to enhance the skills of students in computer-aided design of chemical processes as well as safe design practices. Towards this goal, it was decided to

- modify a core required course on Numerical methods in Chemical Engineering (ECH3854) taught in the second-year of a the four-year program. The modifications included introducing Aspen Design Software for chemical processes at this early level (2nd year) as opposed to only to seniors (beginning of 4th year of BS studies).
- add a required course on Chemical Process Safety to be taken by all graduates of the program.

Both changes will be fully implemented in 2020 and the outcome will continue to be assessed to determine the impact of the above curricular changes.

Plan Review Comments

Report Review Comments

Goal 2: Critical Thinking Skills

Students will develop Critical Thinking skills.

1a. Student Learning Outcome Statement   *Audit Review: AC*

Graduates of this program will demonstrate an ability to apply **engineering design** to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors (cf. ABET Outcome 2)

1b. Method of Assessment   *Audit Review: AC*

All students in the program are required to take a capstone design course. In this course students are expected to demonstrate an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. This is a semester long project at the end of which the students will be asked to submit a comprehensive written and oral report. This outcome will be assessed by a committee consisting of faculty, teaching assistants and members of the Departmental Industrial Advisory Board. They will be asked to rate the ability of the student to critically evaluate and use appropriate engineering tools to solve a practical problem in chemical engineering.

The following rubric will be used:
1. Rating of 1. Poor. The students are lacking the ability to use modern engineering tools to solve a practical problem
2. Rating of 2. Fair. While the students demonstrate some understanding of modern engineering tools and skill sets, they are not able to critically evaluate and apply the appropriate techniques.
3. Rating of 3. Good. The students demonstrate good critical thinking skills in selecting and using appropriate tools for solving practical engineering problems.
4. Rating of 4. Very Good. The design is complete and technically correct. They took into considerations most of the constraints and the economic analysis is sound. The conclusions reached and recommendations made are valid but not all were backed up with sufficient evidence. Overall they demonstrate good understanding and use of modern engineering tools and techniques to solve practical problems.
5. Rating of 5. Excellent. The group did a very professional execution of the design project, ending up with a design that is complete. They took into consideration various constraints and came up with an economically and technically feasible solution. They were able to communicate their design solution in a clear and pertinent manner. The technical part appears to be sound and economics makes sense. The conclusions reached are valid and justified. Their recommendations are backed up with sound technical and economic arguments. They demonstrated a solid understanding of modern engineering tools and how to use them appropriately.

To ensure reliability of the assessment instrument for this outcome, the members of the Departmental Graduate Committee reviews the rubric periodically and recommends revisions if necessary. After the ratings are compiled an average rating is computed based on the average ratings from faculty, teaching assistants and advisory board members. The departmental Undergraduate Committee then reviews these ratings and makes recommendations for program changes as needed.

1c. Performance Targets   *Audit Review: AC*

The ratings of the faculty, Teaching Assistants and members of the Industrial Advisory Board would be collected and averaged. The performance target is to achieve an average rating of 4.0 or above for the class as a whole. The average rating the Instructor is also expected to be 4.00 or above. An average significantly below 4.00 would require the faculty to consider remedial actions.

1d. Assessment Results   *Audit Review: AC*

At the end of the Spring semester, the Undergraduate Industrial Advisory Board gathered with faculty and teaching assistants to review the Capstone Design Course Posters prepared by the students in the Senior Design Course. There were 24 posters presented by student groups. Each poster was judged by 3 teams of judges. The results were as follows:
Average Advisory Board Ratings: 3.92

Average Faculty Ratings:3.90
Average TA Ratings: 3.88
Overall average: 3.90

1e. Use of Assessment Results *Audit Review: AC*

Use of Assessment results 1e:
The Assessment Results from spring 2019 were presented to the Departmental Assessment Committee, the Industrial Advisory Board, and the Departmental Faculty who discussed these and other findings. The results were slightly below the desired performance target. The committee recommended that

- this Outcome be continued to be monitored to see if there is a trend and to see if the curricular changes outlined under Goal 1 in section 1e will have positive impact for Goal 2.
- addition of a course on Product Design. By educating students in both Process and Product design aspects will enhance the ability of the graduates to apply engineering design to produce solutions to meet societal needs.

The Outcome under Goal 2 will continue to be assessed in 2020.

Plan Review Comments

Report Review Comments

Goal 3: Communication Skills

Students will develop Communication Skills.

1a. Student Learning Outcome Statement *Audit Review: AC*

Graduates of this program will demonstrate an ability to communicate effectively with a range of audiences both in written form and orally.

1b. Method of Assessment *Audit Review: AC*

Every student in this program is required to take a capstone design course. In this course they are asked to apply their engineering knowledge and skills to design a process or product that meets certain specifications taking into consideration economic, societal, environmental and global considerations. They are then asked to write a detailed report summarizing their findings. They are also required to present and discuss their results in front of a judging committee consisting of representatives from industry, faculty and teaching assistants. The judging team then rates the report and presentation using the following rubric:

Rating of 5: The group did an excellent job of communication their ideas and design both orally and in their poster. They were able to answer all the questions in a clear and succinct manner. The report was done professionally and the poster was very neat and organized. They were able to articulate their ideas clearly. They spoke without hesitation and in an enthusiastic manner
Rating of 4: The group did a good job of presenting their work both orally and in written form. The report was clear and well organized. They were able to answer most questions. They spoke clearly and without hesitation. They communicated well with the audience
Rating of 3: The group communicated their ideas effectively. The report was neat and error free. The poster was organized reasonably well. They were able to answer most questions, but stumbled on a few. They spoke clearly and professionally.
Rating of 2: The presentation was okay, but lacked professional quality. The response to questions were adequate but showed a lack of understanding and ability to think on their feet.
Rating of 1: The slides were done poorly and poster was not organized. They were not able to answer questions correctly. They showed a lack of understanding of the problem and the issues thereof. They could not articulate their thoughts clearly. They made spelling and grammatical mistakes.

To *ensure reliability of the assessment instrument for this outcome, the members of the Departmental Assessment Committee reviews the rubric periodically and recommends revisions if necessary.*

After the ratings are compiled an average rating is computed based on the average ratings from faculty, teaching assistants and advisory board members.

The departmental Undergraduate Program Assessment Committee then reviews these ratings and makes recommendations for program changes as needed.

1c. Performance Targets *Audit Review: AC*

It is expected that the average rating will be at least 4.0 or higher. A rating significantly below 4.0 will require a review of the curriculum to ensure that

the students are getting the necessary preparation to meet this outcome.
The results of the assessment will be presented to the Departmental Assessment Faculty Committee for review and action if needed.

1d. Assessment Results   *Audit Review: AC*

At the end of the Spring semester, the Undergraduate Industrial Advisory Board gathered with faculty and teaching assistants to review the Capstone Design Course Posters prepared by the students in the Senior Design Course. There were 24 posters presented by student groups. Each poster was judged by 3 teams of judges. The results were as follows:
Average Advisory Board Ratings: 4.21
Average Faculty Ratings:4.19
Average TA Ratings: 4.21
Overall average: 4.20

1e. Use of Assessment Results   *Audit Review: AC*

Use of Assessment results 1e: The Assessment Results from spring 2019 were presented to the Departmental Assessment Committee, the Industrial Advisory Board, and the Departmental Faculty who discussed these and other findings. Based on these results that all ratings were sufficiently above the target of 4.0, it was recommended that no changes were necessary in the curriculum for this outcome at this point. The Outcome will continue to be assessed in the coming year.

Plan Review Comments

Report Review Comments

Assessment Methods

Course Related Assessments

Oral Presentation
Written Report or Essay
Instructor Constructed Exam
Course Embedded Assignment
Class Performance or Presentation
Project Evaluation
Lab Reports
Problem-Solving Exercise

Cumulative Assessments

Portfolio of Student Work

Performance Related Assessments

Professional Judged Performance or Demonstration of Ability in Context

External-course Assessments

Standard Assessments