Program Assessment Report (PAR)

Renewable and Clean Energy Egr (RCEE) Masters Degree

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ACADEMIC YEAR COVERED BY THIS REPORT: 2021-2022

I. PROGRAM LEARNING OUTCOMES

The outcomes of the MSRCEE are listed below. Outcome 1 Graduates will obtain employment suitable to their field or continue to further graduate study. Outcome 2 The ability to apply advanced engineering analysis techniques to the solution of complex problems. Outcome 3 The ability to articulate the results of complex engineering problems in written or oral form.

II. PROCEDURES USED FOR ASSESSMENT

A. Direct Assessment

Closed loop process 1. Data collected by Master's program chairs during academic year 2. CQI committee analyzes and drafts suggestions 3. Charge grad committees with action 4. Grad committees report back with actions taken 5. Make improvements and repeat Outcome 1. Direct assessment Data collected from students who graduated, % of students employed and % going on to grad study Outcome 2. Direct assessment class exams collected from ME7500, 3 data points total Outcome 3. Direct assessment class exams collected from ME7500 and thesis/papers/project reports collected, 3 data points total ME7500 is taken by all students in the Renewable and Clean Energy Program in Engineering. All students in the program either do a thesis or a semester long independent project with report.

B. Scoring of Student Work

The rubrics shown below are used to rate student mastery.. Student work is evaluated by course instructors, thesis committee, or advisor. Numerical ratings follow the rubic Outstanding 95-100 Student demonstrates mastery of content

and/or sophisticated analysis of problem nuances Strong 80-95 Student demonstrates competence at content and understanding of problem fundamentals. Small flaws in computation or logic may be present Acceptable 70-80 Student demonstrates basic understanding of content, but lacks depth. Significant errors or flaws in work present Developing 60-70 Student lacks basic understanding. Struggles to start the problem or frame a valid analysis Needs improvement

C. Indirect Assessment

Outcome 1. Indirect assessment MME Graduate Student Exit Survey wihich includes RCEE program. This survey form is attached. Outcome 2. Indirect assessment MME Graduate Student Exit Survey wihich includes RCEE program. This survey form is attached. Outcome 3. Indirect assessment MME Graduate Student Exit Survey wihich includes RCEE program. This survey form is attached.

III. ASSESSMENT RESULTS/INFORMATION:

Outcome 1. Graduates will obtain employment suitable to their field or continue to further graduate study Direct assessment % of students employed, % going on to grad study Indirect assessment MS Exit Interview Outcome 2. The ability to apply advanced engineering analysis techniques to the solution of complex problems Direct assessment class exams collected, 3 data points total Indirect assessment MS Exit Interview Outcome 3. The ability to articulate the results of complex engineering problems in written or oral form. Direct assessment class final exams collected, 3 data points and/or thesis/papers/project reports Indirect assessment MS Exit Interview

Outcome 1. Direct assessment Qualtrics alumni survey, 2020, 4 responses to the question "True/False My MS degree helped me obtain a job/promotion or helped me pursue an advanced degree." 3/4 True. The one false response is from an older, retired person who is not looking for work. Indirect assessment MS exit survey, 2020-2021, Q33 "Please indicate your level of agreement with the following statement My MS degree helped me obtain a job/promotion in my field or helped me pursue an advanced degree." Only 1 response 4. Average response was 4.0/5.0. Outcome 2. Direct assessment Assessment 1 ME 7500 Final Exam, Spring 2020, Q1 Working with the inter-molecular pair-potential for a dense gas, 8 students 3 outstanding, 0 strong, 0 acceptable, 1 developing, 4 needs improvement. 38% acceptable or above. Assessment 2 ME 7500 Final Exam, Spring 2020, Q1 Working with entropy, 8 students 3 outstanding, 1 strong, 0 acceptable, 0 developing, 4 needs improvement. 50% acceptable or above. Assessment 3 ME 7500 Homework #5, Spring 2020, Working with partition function, 8 students 8 outstanding, 0 strong, 0 acceptable, 0 developing, 0 needs improvement. 100% acceptable or above. Indirect assessment MSME exit survey, 2020-2021, Q34, "Please indicate your level of agreement with the following statement My MS degree contributed to my ability to apply advanced engineering analysis techniques to the solution of

complex problems." Only 1 response 4. Average response was 4.0/5.0. Outcome 3. Direct assessment Assessment 1 ME 7500 Final Exam, Spring 2020, Q3 Essay Thermodynamic Properties of Solute and Solvents, 8 students, 8 outstanding, 0 strong, 0 acceptable, 0 developing, 0 needs improvement. 100% acceptable or above. Assessment 2 Writing and defending thesis, 1 student 1 outstanding, 0 strong, 0 acceptable, 0 developing, 0 needs improvement. 100% acceptable or above. Assessment 3 ME 7500 Final Exam, Spring 2020, Written report on industrial applications of thermodynamic equation of states in literature, 8 students, 0 outstanding, 0 strong, 0 acceptable, 2 developing, 6 needs improvement. 0% acceptable or above Indirect assessment MSME exit survey, 2020-2021, Q35, "Please indicate your level of agreement with the following statement My MS degree contributed to my ability to articulate the results of complex engineering problems in written or oral form." Only 1 response 4. Average response was 4.0/5.0.

Outcome 1. In regards to obtaining employment, the students are doing very well. All students who were seeking employment, obtained employment. There were no students in this cycle who applied to graduate school. In the past, RCEE students have made it into graduate school. Outcome 2. these results indicated there is room for improvement for outcome #2. It should be noted that ME7500 is a difficult class. This class was chosen for assessment becasue all MSRCEE students must take this course. Outcome 3. According to survey results, students are acceptable with articulating thier technaical engineering knowledge with two measures and unacceptable with the third measure. In the RCEE program, most students are from outside the United States. English grammar is a struggle for some of these students.

IV. ACTIONS TO IMPROVE STUDENT LEARNING

Based on results of the prior assessment cycle, the CQI committee determined that direct assessment of Outcome 3 required the identification of required courses that include an oral presentation or written report. This result was shared with the Graduate Studies Committee, which subsequently conducted a survey of the MME faculty to identify all such courses. A subset of these courses will be used in the next assessment cycle to provide a more robust assessment of Outcome 3. These actions are documented in the minutes of the November, 2021 CQI meeting (attached). In 2021-2022, signficant faculty discussion/action occurred regarding assessment of student learning in our graduate programs, with a focus on satisfaction of Outcome 3. In particular, there was some concern that non-thesis students may be able to navigate our graduate programs without taking a course having a signficant writing/communication component. As a result, the writing/communication component survey data provided by the faculty graduate course coordinators was cross-checked against the transcripts of all students earning graduate degrees in either the Spring 2021 or Fall 2022 semesters. The results of both the faculty survey and the cross-check are attached. For the Renewable and Clean Energy program all non-thesis students must do a project course for which a major written report is required. This, along with writing in the courses

surveyed, garentees that all graduates from the Renewable and and Clean Energy Master's Degree Program have sufficient writting in their degree. Based on the above analysis, it was determined that all non-thesis students graduating in that timeframe took at least 2 courses having a signficant writing/communication component. Coupled with the extensive writing/communication requirements of our M.S. thesis students, this suggests that our graduate programs are appropriately structured to address Outcome 3. As documented in the minutes of its latest meeting (attached), the CQI committee is prepared to suggest a new MS degree program requirement to ensure the satisfaction of Outcome 3 by all students. However, based on our current slate of graduate course offerings and the analysis presented above, such a change may not be necessary at this time.

V. SUPPORTING DOCUMENTS

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.