BSRenewable Energy Engineering

2017-18 Assessment Report

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Contents

1 Introduction

1.1 Program Design and Goals

The Bachelor of Science in Renewable Energy Engineering (BSREE) program at Oregon Institute of Technology (Oregon Tech) has been designed to provide interdisciplinary education in mechanical, electrical, and chemical engineering topics as they apply to renewable energy. Students take coursework in

industry cluster in the Pacific Northwest convinced us that an engineering degree, the BSREE degree, was the only suitable option for our students.

2 Program Mission, Educational Objectives and Outcomes

2.1 Program Mission

The mission of the Renewable Energy Engineering degree program is to prepare students to meet the challenges of a fast-changing energy related industry cluster, particularly within Oregon and the Pacific Northwest. Graduates will have a fundamental understanding of energy engineering and a sense of social responsibility for the implementation of sustainable energy solutions. The department will be a leader in providing career ready engineering graduates for various renewable energy engineering fields. Faculty and students will engage in applied research in emerging technologies and provide professional services to their communities.

2.2

Starting with the 2018-19 academic year, assessment will be done using the new (1)-(7) student outcomes below

New ABET outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

2. 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

3. an ability to communicate effectively with a range of audiences

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

We will be assessing (1)-(7) from now on. Basically

(1) covers the old ABET outcomes (a) and (c)
(4) covers the old ABET outcomes (f), (h), and (j).

3 Cycle of Assessment for Program Outcomes

3.1 Introduction and Methodology

Assessment of the program outcomes is conducted over a three year cycle. The assessment cycle was changed during the 2014-15 assessment year. This change was implemented at an assessment coordination meeting on February 2, 2014. At this meeting, assessment coordinators representing each program in the Electrical

Table 2: New BSEE Outcome Assessment Cycle

N. B. To collect the assessment data for 2018 ESLO Ethical Reasoning for REE) the course REE 454 has been selected for both campus.

3.3 Summary of Assessment Activities & Evidence of Student Learning

3.3.1 Introduction

The BSREE faculty conducted formal assessment during

The mapping proces aims to systemize the assessment of engineering coursework, and to provide a mechanism

are presented and discussed with all the department faculty at the annual Convocation meeting in Fall, as well as with the Industry Advisory Council (IAC) at the following IAC meeting. If approved, these changes are implemented in the curriculum and submitted to the Curriculum Planning Commission (if catalog changes are required) for the following academic year.

3.3.3 2017-18 Targeted Direct Assessment Activities

The sections below describe the 2017-18 targeted assessment activities and detail the performance of students for each of the assessed outcomes. Unless otherwise noted, the tables report the number of students performing at a developing level, accomplished level, and exemplary level for each performance criteria, as well as the percentage of students performing at an accomplished level or above.

3.3.4 Targeted Assessment for Outcome (a): an ability to apply knowledge of mathematics, science, and engineering

This outcome was assessed in EE 321 Electronics I.

Outcome (a): Wilsonville, EE 321, Fall 2017, Dr. Aboy

This outcome was assessed in EE 321 Electronics I in Fall 2017 by means of a lab assignment. The lab assignment consisted of designing, simulating, implementing, and experimentally testing an AC to DC power supply and linear regulator with current boosting to provide an adjustable regulated output voltage with short circuit/overload protection. Students were provided with a series of specifications and design constraints. Once the design was finalized (analyzed theoretically) and the simulations indicated the results were met, students were required to physically implement their designs and experimentally test them. Finally, the students were required to write a record and video demo showing their working design and write a brief (3 page) report documenting their design. The assignment involved the application of fundamentals (i.e., to apply knowledge of mathematics, science and engineering) in order to design the power supply.

Twelve students were assessed in Fall 2017 in the course EE321 Electronics I using the performance criteria listed in the table below. The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria.

Table (2) summarizes the results of this targeted assessment. The results indicate that the minimum acceptable performance level of 80% was met on all performance criteria for this program outcome, that is, over 80% of students were able to apply mathematics, science and engineering fundamentals to design an adjustable power supply with a discrete regulator.

Table 2 - Outcome (a): Wilsonville, EE 321, Fall 2017, Dr. Aboy

Outcome (a) an ability to apply knowledge of mathematics, science, and engineering				
Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	%Students >= 2
1 - Math	2	10	0	83.3%
2 - Science	2	10	0	83.3%

3 - Engineering	1	11	0	91.67%

c

3.3.5 Targeted Assessment of Outcome (c): 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 outcome was assessed in EE 355 Control System Design and ENGR 465 - Senior Capstone Project

Outcome (c): Klamath Falls, EE 355, Spring 2018, Dr. Hossain

This outcome was assessed in EE 355 Control System Design in Spring 2018 by means of a project. The tasks consisted of control system design of different systems including induction motor drive, magnetic levitation system, solar tracking system, and vertical axis wind turbine. The students were required to have the theoretical knowledge to perform these tasks, carry out the necessary design, and present their works with necessary details.

Fourteen (14) students were assessed in Spring 2018 using the performance criteria listed in table below. The minimum acceptable performance level was 1 694lg97 [illegible] 8(n%8( )]206(af)-7)]206(ahe)] TJ ET Q q 0.0

[illegible]

Table

Outcome (c): Klamath Falls, ENGR 465, Spring 2018, Dr. Shi

The outcome was assessed using the senior projects of ENGR465 Senior Capstone Project. Project topics were offered for students to select to conduct research, design systems, collect data, analyze and interpret data. Students were allowed to choose their own topics to finish the projects. The projects are designed to test

constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. ENGR465 senior project covers any types of renewable energy. Therefore the scope of the project for students to design, conduct experiments and analyze the data is confined in the area of renewable energy related systems. This project was designed as a team based project. Students teamed up by themselves

her team

divided into 5 groups with 5 in one group, 1 in one group, 3 in one group, 4 in one group, and 1 in other group. During the implementation process, 3 presentations were scheduled for students to present the progresses on their projects. And final reports with collected data and data analysis were collected to evaluate their performance and assess the outcome.

The total 14 students were assessed using the performance criteria listed below. The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria.

The table below summarizes the results of this data assessment. The results indicate that the performance level higher that 80% was met on the performance criteria for this program outcome, demonstrating that the

3.3.6 Targeted Assessment of Outcome(d): an ability to function on multi-disciplinary teams

Table 6 - Outcome d(1): Wilsonville, REE 412, Winter 2018, Dr. Petrovic

Performance Criteria	1 - Developing	2 - Accomplished	3 - Exemplary
D1 Participation in teams	0	0	15

Table 7 - Outcome (e): Klamath Falls, REE 337, Winter 2018 Shi

(e) An ability to identify, formulate, and solve engineering problems.				
Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	% student >2
E1: Identifies technical problems	0	0	100%	100%
E2: Identifies problem statement and parameters.	11.11%	0	88.89%	88.89%
E3: Collects data resources and information for a problem	0	31.25%	68.75%	100%

3.38 Targeted Assessment of Outcome (i): a recognition of the need for, and an ability to engage in lifelong learning.

This outcome was assessed in REE 463 - Energy Systems Instrumentation

Outcome (i): Klamath Falls, REE 463, Spring 2018, Dr. Hossain

This outcome was assessed in REE 463 Energy Systems Instrumentation in Spring 2018 by means of lab work. The tasks consisted of curve fitting, simulation and hardware implementation of Wheatstone bridge, and analyzing system behavior through step and impulse response. The students were required to have the theoretical knowledge to perform these tasks, carry out the necessary simulation, hardware implementation, and measurement, and present their works with necessary details.

Eleven (11) students were assessed in Spring 2018 using the performance criteria listed in the table below. The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria.

Table 8 summarizes the results of this targeted assessment. The results indicate that the acceptable a performance level of 80% was met on all performance criteria for this program outcome, that is, over 80% of students were able to identify and perform the professional, ethical, and social responsibilities while carrying out their assigned tasks

Table 8 - Outcome (i): Klamath Falls, REE 463, Spring 2018, Dr. Hossain

Outcome (i): a recognition of the need for, and an ability to engage in lifelong learning				
Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	%Students >1
1 - Demonstrates an awareness of what needs to be learned	0	0	11	100%
2 - Identifying, gathering and analyzing information.	1	6	4	90.91%

Outcome (i): Wilsonville, REE 463, Winter 2018, Dr. Melendy

ABET Outcome (i) was assessed by means of a laboratory assignment in which students conducted a comprehensive, multidisciplinary experiment. The objective of this experiment was to have the students recognize the need for sensors, actuators, and electronic circuitry in measuring equipment and instrumentation engineering. An equally important objective was to have students recognize the need for Newtonian mechanics and the mechanical properties of materials in the development of electronic instrumentation related to energy systems.

Eleven (11) REE majors were assessed using the performance criteria (Table 1). The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria. The results indicate that the minimum acceptable performance level of 80% was met on the performance criteria for this program outcome.

The majority of the students met or exceeded expectations, they demonstrated their abilities to interface sensors and actuators with various metal test specimens, how sensors and actuators interface with various electronic circuitry to form different types of energy systems instruments, how the different forms of measurements are interrelated with sensors, actuators, and recording instrumentation, and how experimental research is conducted using instruments and components that the researcher designs and builds.

Table 9- Outcome (i): Wilsonville, REE 463, Winter 2018, Dr. Melendy

Outcome (i): a recognition of the need for, and an ability to engage in lifelong learning.			
Performance Criteria	1-Developing	2-Accomplished 3-Exemplary	%Students >= 1

Outcome (j

Outcome (j): Klamath Falls, REE 407, Spring 2018, Dr. Shi

The outcome was assessed using the course projects of REE407 Solar Power System III taught in Spring 2018.

Outcome (j): Wilsonville, REE455, Spring 2018, Dr. Jiru

This outcome was assessed in REE 455 Energy Efficient Building Design in spring 2018 using project reports and oral presentations. Each student were assigned an oral presentation topic and were required to deliver a 30 minute oral presentation. The topics cover contemporary building energy efficiency technologies that reduce energy consumption and improve environmental quality.

Eight students were assessed in spring 2018 using the performance criteria listed below. The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria.

Table below summarizes the results of this targeted assessment. The results indicate that the minimum acceptable performance level of 80% was met on all performance criteria for this program outcome. 80% of the students met or exceeded expectations; they demonstrated knowledge of contemporary issues.

Outcome (j) a knowledge of contemporary issues				
Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	%Students >= 2
Environmental context	1	5	2	87.5%

3.3.10 2017-18 Indirect Assessments

In addition to direct assessment measures, the student outcomes through (a) through (k) were indirectly assessed through a senior exit survey conducted every year in the spring term. Question BREE 1 in the survey asked

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative

3- Knowledge of contemporary issues (environmental context)	11	11	100%

Outcome (i): independent learning

- Results: The results show that the threshold of attainment of this outcome was exceeded in all performance criteria.
- Recommendation: The faculty identified no problem with this outcome, and therefore recommended no changes at this time.

Outcome (j): contemporary issue

- Results: The results show that the threshold of attainment of this outcome was exceeded in all performance criteria.
- Recommendation: The faculty identified no problem with this outcome, and therefore recommended no changes at this time.