Electrical Engineering
2014–2015 Assessment Report

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Contents

1 Introduction

1.1 Program Goals and Design

The Bachelor of Science in Electrical Engineering program at Oregon Institute of Technology (Oregon Tech) aims to impart a thorough grounding in the theory, concepts, and practices of electrical engineering. Emphasis is on practical applications of engineering knowledge. The goal of our program design is to graduate engineers who require minimal on-the-job training while providing them with sufficient theoretical background to enable success in graduate education in engineering.

1.2 Program History

In 2007, Oregon Tech began offering its new Bachelor of Science in Electrical Engineering (BSEE) program at its Klamath Falls campus. In Fall 2012, the BSEE degree started to also be offered at the Wilsonville campus. The BSEE degree is a traditional EE degree that was created to prepare graduates for careers in various fields associated with Electrical Engineering. These include, but are not limited to, analog integrated circuits and systems, digital integrated circuits and microcontroller systems, signal processing, communication systems, control systems

addition, each advisory-committee member serves as a vehicle for public-relations information and potentially provides a point of contact for the development of specific opportunities with industry for students and faculty.

1.4 Program Locations

The BSEE program is located at both Oregon Tech campuses (Klamath Falls and Wilsonville), serving a large portion of rural Oregon and California, as well as the Portland metropolitan area. Oregon Tech is the only university offering multiple classical engineering degrees at the Bachelor's (and some at the Master's) level in a region ranging from Corvallis, Oregon, in the north, to Chico, California, in the south, and from the Pacific coast in the west to Boise, Idaho, in the east.

The Klamath Falls campus includes a large solar facility, Oregon Renewable Energy Center (OREC), and the affiliated Geo-Heat Center, with exceptional opportunities for students to gain experience in the subfields of power, energy, and renewable energy. OREC, as stated on its website, "promotes energy conservation and renewable[-]energy use in Oregon and throughout the Northwest through applied research, educational programs, and practical information." These resources give students access to research practical experience in geothermal, solar, wind, biofuel, waste, fuel-cell, and other sources of green energy.

The Wilsonville campus offers excellent access to internships and other technological collaboration with the Silicon Forest (as the semiconductor industry in the Portland metropolitan area is known).

This arrangement satisfies the needs of the state of Oregon by placing a traditional EE program in the southern, rural part of the state to serve that region as well as providing a small-school EE program to students who desire a low student-to-faculty ratio and small classes.

2 Program Mission, Educational Objectives and Outcomes

2.1 Program Mission

The mission of the Electrical Engineering Bachelor of Science degree program is to provide a comprehensive program of instruction that will enable graduates to obtain the knowledge and skills necessary for immediate employment and continued advancement in the field of electrical engineering. The program will provide high-quality career-ready candidates for industry as well as teaching and research careers. Faculty and students will engage in applied research in emerging technologies and provide professional services to their communities.

2.2 Program Educational Objectives

In support of this mission, the Program Educational Objectives for the BSEE program are:

> The graduates of the BSEE program will possess a strong technical background as well as analytical, critical-thinking, and problem-solving skills that enable them to excel as professionals contributing to a variety of engineering roles within the various fields of electrical engineering and the high-tech industry.

Likewise, problem-solving is a pervasive aspect of the BSEE from the interdisciplinary course on the introduction to engineering to the often-interdisciplinary senior project.

PEO 2 is aligned with the institution's mission to fulfill the emerging technology needs of Oregon as the BSEE prepares students to take their place in the work force as design engineers, test engineers, characterization engineers, applications engineers, field engineers, hardware engineers, process engineers, control engineers, and power engineers.

The institution's mission emphasizes graduate success along with student success, and this is where the commitment to lifelong learning (PEO 3) aligns with the mission. Furthermore, the mission statement's specification that "to foster student and graduate success, the university provides and intimate, hands-on learning environment, focusing on application of theory to practice" is also in strong alignment with the BSEE program due to the prominence of small classes, the hands-on focus of the program, and faculty-taught laboratories.

2.4 Program Outcomes

The BSEE student outcomes follow ABET's EAC (a)–(k) student outcomes. The program-specific outcomes (l) and (m) were removed from the list by recommendation of ABET evaluators and subsequent approval by the EERE faculty and the IAB.

The BSEET Student Outcomes are:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(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
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global, econ

3 Cycle of Assessment for Program Outcomes

3.1 Introduction, Methodology, and the Assessment Cycle

Assessment of the program outcomes is conducted over a three year-cycle. Table 1 shows the minimum outcomes assessed each year. 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 within the Electrical Engineering and Renewable Energy (EERE) Department aligned their assessment cycles so that each program assesses similar outcomes on the same years. The intention for this change is to better organize the assessment process and produce more meaningful data for comparison between different programs in the EERE Department.

Effective the 2014-15 academic year, the assessment cycle begins in the Spring. In previous years, the assessment cycle started in the Fall. This change reflects a shift on an institutional level to begin data collection in the spring term. In 2012-13 the Assessment Commission Executive Committee began recommending that programs begin data collection for the upcoming year during Spring term. This recommendation was based on the fact that many programs found the best courses to embed assessment

In addition to the outcomes scheduled for a particular year, assessment is also performed for Oregon Tech's Institutional Student-Learning Outcomes (ISLOs) that are scheduled for that particular year by the Executive Council of the Assessment Commission.

3.2

Collect more data (if there is insufficient data to reach a conclusion as to whether the outcome is being attained or not); this may be the appropriate course of action when assessment was conducted on a class with low enrollment, and it is recommendable to re-assess the outcome on the following year, even if it is out-of-cycle, in order to obtain more data.

Make changes to the assessment methodology (if the faculty believe that missing the performance target on a specific outcome may be a result of the way the assessment is being conducted, and a more proper assessment methodology may lead to more accurate numbers); for example, this could be the suggested course of action if an outcome was assessed in a lower-level course, and the faculty decide that the outcome should be assessed in a higher-level course before determining whether curriculum changes are truly needed.

Implement changes to the curriculum (if the faculty conclude that a curriculum change is needed to improve attainment of a particular outcome). A curriculum change will be the course of action taken when the performance on a given outcome is below the target level, and the evidence indicates that there is sufficient data and an adequate assessment methodology already in place, and therefore there is no reason to question the results obtained.

If the faculty decide to take this last course of action and implement curriculum changes, the data from the direct assessments is analyzed and the faculty come up with a plan for continuous improvement, which specifies what changes will be implemented to the curriculum to improve outcome performance.

In addition to direct assessment measures, indirect assessment of the student outcomes is performed on an annual basis through a senior exit survey.

The results of the direct and indirect assessment, as well as the conclusions of the faculty discussion at the Closing-the-Loop meeting are included in the annual %6EE Assessment Report, which is reviewed by the Department Chair and the Director of Assessment for the university. The suggested changes to the curriculum are presented to td3.981(in)-103.981w 48.68]tCh07Td[49.2c 0.294 TF6ll,134.3489(hi)0.5198lum hi mehehi me

3.2.4 Targeted Assessment of Outcome (a): An ability to apply knowledge of mathematics,

principles. Students were required to write a complete report following the guidelines of the IEEE Transactions Journals (IEEE Transactions Publication-Ready Template and Instructions for Authors).

Twelve students were assessed 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 4 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 knowledge of mathe

Table 5: Targeted Assessment for Outcome (a)

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

Table 6: Targeted Assessment for Outcome (c)

(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				
Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	%Students >= 2
1 - Need	2	0	7	77.78%
2 - Design	0		0	100%

Table 7: Targeted Assessment for Outcome (c)

(c) an

Table 10 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. In fact, 100% of the students assessed showed the required level of proficiency at being able to function in a multidisciplinary team.

Table 10: Targeted Assessment for Outcome (d)

Outcome (d): An ability to function effectively on multidisciplinary teams				
Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	%Students >= 2
1—Team participation and communication	0	3	8	

Table 11: Targeted Assessment for Outcome (d)

Outcome (d): an ability to function in multi-disciplinary teams (major project)				
Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	%Students >= 2
1—Team participation and communication	0	2	2	100%
2—Developing a group consensus	0	1	3	100%

Table 12: Targeted Assessment for Outcome (j)

Outcome (j): a knowledge of contemporary issues				
Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	%Students >= 2
1—Knowledge of contemporary issues	6	4	7	64.7%
2—Recognizing the temporal nature of contemporary issues	7	8	2	58.8%
3— Recognizing the historical context of contemporary issues	8	9	0	52.9%

Assessment (j) 2: Klamath Falls, EE 401, Spring 2014, Dr. Vurkaç

This outcome was assessed in EE 401 – Communication Systems by means of a literature-search paper. Students were asked to write a paper investigating contemporary communications systems. The dimensions to be addressed included socio-economic, political, environmental, and historical aspects of the technology,

Table 13: Targeted Assessment for Outcome (j)

Outcome (j): a knowledge of contemporary issues	
Performance Criteria	1-

2014

Outcome	Inadequately prepared	Prepared	Highly prepared
a. an ability to apply knowledge of mathematics, science, and engineering	1	3	9
b. an ability to design and conduct experiments, as well as to analyze and interpret data	1	4	8
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	1	3	9
d. an ability to function on multi-disciplinary teams	1	3	9
e. an ability to identify, formulate, and solve engineering problems	1	4	8
f. an understanding of professional and ethical responsibility	1	4	8
g. an ability to communicate effectively	1	4	8
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	1	4	8
i. an ability to engage in independent learning and recognize the need for continual professional development	1	3	9
j. a knowledge of contemporary issues	3	4	6
k. an ability to use the techniques, skills, and modern engineering			

4 Changes Resulting from Assessment

(d) Teamwork (Wilsonville, EE432, Spring 2014, Prof. Almy)			
1- Participation	4	4	100%
2- Decision Making	4	4	100%
3- Team Management	4	4	100%

(j) Contemporary Issues (

(3) Ensure the BSEE advisors are familiar with the general education elective courses so that they can make better recommendations to students during the advising process that ensure proper coverage of contemporary issues).