

— B. S. in Electrical Engineering —

2019-20 Assessment Report

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1 Introduction

1.1 Program Design and Goals

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 Portland Metro 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, semiconductors, optoelectronics, renewable energy, and biomedical fields as stated in the Oregon Tech catalogs for 2007 through 2021.

The BSEE program prepares graduates to enter careers in the field of electrical engineering in positions such as design engineers, test engineers, characterization engineers, applications engineers, field engineers, hardware engineers, process engineers, control engineers, power engineers, semiconductor-processing engineers, controls and signal-processing engineers, energy system-integration engineers, analog-systems engineers, digital-systems engineers, and embedded-hardware engineers, among others. Graduates of the program will be able to pursue a wide range of career opportunities, not only within the more traditional areas of Electrical Engineering, but also within emerging fields, such as Renewable Energy Engineering and Optical Engineering.

1.3 Program Enrollment and Salary Data

Table 1 presents the program enrollment data from fall 2016 to fall 2020. Table 2 presents the number of BSEE degrees awarded over the same time span. The reported average annual salary of students who graduated between 2018 to 2020 is \$64,000. Over this time span the reported success rate is 87% (Oregon Tech graduates employed, continuing education, or not seeking six months after graduation).

	2016	2017	2018	2019	2020
Klamath Falls	82	75	90	86	76
Portland Metro	115	118	104		85
Total	197	193	194	187	161

Table 1: Electrical engineering enrollment (headcount of both full and part-time students in the fourth week of the fall term) for the last five years

	2015-16	2016-17	2017-18	2018-19	2019-20
Klamath Falls	16	17	14	18	17
Portland Metro	10	20	25	31	16
Total	26	37	39	49	33

Table 2 BSEE degrees awarded for the last five academic years

14 Industry Relationships

The BSEE program has strong relationships with industry, particularly through its program-level Industry Advisory Board (IAB), and through its alumni. These relationships with our constituents allow the BSEE program to meet the institutional goal of maintaining the currency of our degree programs

The IAB has been a mainstay in the development of the EE program since its early roots. The IAB provides advice and counsel to the EE program with respect to curriculum content, instructional resources, career guidance and placement activities, accreditation reviews, and professional-development assistance. In 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.

15 Program Locations

The BSEE program is located at both Oregon Tech campuses (Klamath Falls and Portland Metro), 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 the interior in the east. The program is also available at the Klamath Falls campus.

- The graduates of the BSEE program will be working as effective team members possessing excellent oral and written communication skills, and assuming technical and managerial leadership roles throughout their career.

23 Relationship between Program Objectives and the Institutional Mission

The Oregon Tech mission statement is as follows “Oregon Institute of Technology offers innovative and rigorous applied degree programs in the areas of engineering, engineering technologies, health technologies, management, and the arts and sciences. To foster student and graduate success, the university provides an intimate, hands-on learning environment, focusing on application of theory to practice. Oregon Tech offers statewide educational opportunities for the emerging needs of Oregon’s citizens and provides information and technical expertise to state, national and international constituents.”

The core themes of Oregon Tech are as follows:

- Applied Degree Programs
- Student and Graduate Success
- Statewide Educational Opportunities
- Public Service

The “strong technical background” of PEO 1 corresponds to the rigor required by the institutional mission of Oregon Tech’s degree programs.

PEO 2 is aligned with the institution’s core themes of both public service and graduate success. The Oregon Tech BSEE program 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, serving the needs of Oregon, the nation, and the world.

Furthermore, 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. Moreover, the mission statement’s specification to “foster student and graduate success, the university provides an intimate

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24 Program Outcomes

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

1. an ability to identify, formulate, and solve 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, interpret data, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using learning appropriate learning strategies

Student Outcome	2018-19	2019-20	2020-21	2021-22
(1) Problem Solving			•	
(2) Design			•	
(3) Communication		•		
(4) Ethics	•	KF		•
(5) Teams			•	*
(6) Experimentation	•	KF		•
(7) Learning		•		

Table 3 BSEE Outcome Assessment Cycle. Bullets (•) indicate standard assessment outcomes. Asterisk (*) indicates assessment moved to 2021-22 due to COVID-19 pandemic in 2020-21. KF indicates that this assessment was missed in the previous year and is included in this report.

32 Summary of Assessment Activities & Evidence of Student Learning

The BSEE faculty conducted formal assessment during this academic year using direct measures, such as designated assignments and evaluation of coursework normally assigned. Additionally, the student outcomes were assessed using indirect measures, based on an exit survey of graduating seniors.

33 Methodology for Assessment of Student Outcomes

At the beginning of the assessment cycle, an assessment plan is generated by the Assessment Coordinator in consultation with the faculty. This plan includes the outcomes to be assessed during that assessment cycle (refer to Table 3), as well as the courses and terms where these outcomes will be assessed.

The BSEE mapping process links specific tasks within BSEE course projects and assignments to program outcomes and on to program educational objectives in a systematic way. The programed dur Asnf] o, as

according to the different performance criteria, and assigned a level of 1-developing, 2-accomplished, or 3-exemplary. The results for each outcome are then summarized in a table, and reviewed by the faculty at the annual closing-the-loop meeting.

The standard acceptable performance level is to have at least 80% of the students obtain a level of accomplished or exemplary in each of the performance criteria for any given program outcome. It has been accepted in past closing-the-loop meetings that faculty can set a different threshold if required by the type of assignment or outcome, but must do so prior to the assessment.

If any of the direct assessment methods indicates performance below the established level, that triggers the process of continuous improvement where all the direct and indirect assessment measures

meeting in the fall, as well as with the Industry Advisory Board at the following IAB meeting. If approved, these changes are implemented in the curriculum and submitted to the University Graduate Council (if catalog changes are required) for the following academic year.

34 Targeted Direct Assessment Activities

The sections below describe the targeted assessment activities and detail the performance of students for each of the assessed outcomes. Unless otherwise noted, the tables report the percentage 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.

The target attainment level for all outcomes is 80% of students at level 2.

Outcome	Campus	Performance Criteria	1 Developing	2 Accomplished	3 Exemplary	Students 2
31	PM	Oral	0	5	0	100%
32	PM	Written	0	5	0	100%
33	PM	Graphical	0	5	0	100%
34	PM	Audience	0	5	0	100%
31	KF	Oral	—	—	—	—
32	KF	Written	3	12	5	85%
33	KF	Graphical	1	12	7	95%
34	KF	Audience	2	13	5	90%

Table 4: ENGR 465 assessment of Outcome (3). The Oral performance criteria was not assessed at KF due to campus shutdowns related to the COVID-19 pandemic.

342 Outcome(4) Ethics

Klamath Falls, EE 335, Spring 2020, Dr. Eve Klopf

A targeted direct assessment of this outcome was done in EE 335. Twelve students were assessed.

The assignment was for the students to use their knowledge of microcontrollers and various peripherals to make a device that would be useful during the COVID-19 pandemic.

Outcome	Criteria	1 Developing	2 Accomplished	3 Exemplary	Students ≥ 2
41	Recognize	2	10	2	100%
42	Identify	—	—	—	83%
43	Judge	—	—	—	83%

Table 5: EE 335 assessment of Outcome (4): Ethics

343 Outcome (6) Experimentation

Outcome	Campus	Performance Criteria	1 Developing	2 Accomplished	3 Exemplary	Students 2
7.1	PM	Acquire	0	5	0	100%
7.2	PM	Apply	0	5	0	100%
7.1	KF	Acquire	0	6	14	100%
7.2	KF	Apply	3	15	2	85%

Table 7: ENGR 465 assessment of Outcome (7) on both campuses

35 Indirect Assessments

In¹ addition to direct assessment measures, student outcomes were indirectly assessed through a senior exit survey of graduating students. The specific areas assessed by the Office of Academic Excellence in the 2019-20 Student Survey were:

- **Tools:** An ability to apply knowledge, techniques, skills and modern tools of mathematics, science, engineering and technology to solve broadly-defined engineering problems appropriate to the discipline.
- **Design:** An ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline.
- **Communication:** An ability to apply written, oral, and graphical communication in broadly-defined technical and non-technical environments; and an ability to identify and use appropriate technical literature.
- **Experiments:** An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes;
- **Teamwork:** An ability to function effectively as a member as well as a leader on technical teams

These outcomes in the above list do not exactly match exactly outcomes (1) through (7). This is due to a miscommunication between the EERE Department and the Office of Academic Excellence.

Fifteen BSEE graduating seniors (PM= 9, KF= 6) completed the Senior Exit Survey. In this survey, question Q BEE 1 asked students to rate their proficiency in the five indirect assessment outcomes. Question Q BEE 2 asked students to rate how much their experiences at Oregon Tech contributed their knowledge, skills, and personal development in the five indirect assessment outcomes. The results are presented in the tables below.

As Table 8 shows, all students rate their proficiency level as “High proficiency” or “Proficiency” in all indirect assessment outcomes. Furthermore, as Table 9 shows, the majority (from 93% to 100%) of students rate that Oregon Tech contributed “Very much” or “Quite a bit” to their knowledge, skills, and personal development in all indirect assessment outcomes. Overall, these results correlate well with the direct assessment results.

Indirect Outcome	High proficiency	Proficiency	Some proficiency	Limited proficiency
Tools	9 (60%)	6 (40%)	0 (0%)	0 (0%)
Design	9 (60%)	6 (40%)	0 (0%)	0 (0%)
Communication	10 (67%)	5 (33%)	0 (0%)	0 (0%)
Experiments	6 (40%)	9 (60%)	0 (0%)	0 (0%)
Teamwork	8 (53%)	7 (47%)	0 (0%)	0 (0%)

Table 8 Student survey results showing how students rate their proficiency for each of the five listed outcomes.

Indirect Outcome	Very much	Quite a bit	Some	Very little
Tools	10 (67%)	5 (33%)	0 (0%)	0 (0%)
Design	9 (60%)	6 (43%)	0 (0%)	0 (0%)
Communication	5 (33%)	10 (67%)	0 (0%)	0 (0%)

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4 Summary

More than 80% of the students were accomplished or exemplary in all criteria assessed.

4.1 Evaluation and Continuous Improvement

The BSEE faculty met on 10 October 2019 to review the assessment results and determine whether any changes were needed to the BSEE curriculum or assessment methodology based on the results presented in this document. This Closing-the-Loop meeting provides faculty a chance to reflect and assess data and trends with regards to continuous improvement.

The objective set by the BSEE faculty was to have at least 80% of the students perform at the level of accomplished or exemplary in all performance criteria of the assessed outcomes. This level was met.

	2015-16	2016-17	2017-18	2018-19	2019-20
(3) Communication			N = 43		N = 12
Oral			98%		100%
Written			98%		83%
Graphical			—		83%
Audience			—		83%
(4) Ethics	N = 18	N = 5		N = 12	N = 12
Recognize	94%	100%		100%	100%
Identify	80%	100%		83%	—
Judge	—	—		83%	—
(6) Experimentation	N = 56	N = 8		N = 17	N = 5
Design and Conduct	71% or 84%	100%		82%	100%
Analyze and Interpret	64%	100%		82%	100%
Engineering Judgement	—	—		82%	100%
(7) Learning			N = 38		N = 17
Acquire			84%		82%
Apply			98%		82%

Table 10 Historical record of the percentage of students scoring 2 (accomplished) or 3 (exemplary) Sample size and results includes combined total of students for each outcome evaluated within the assessed year. In prior years, old ABET outcomes are matched with new ones as shown in Table 11.

Old outcomes	Current outcome
(a) + (e)	(1)
(c)	(2)
(g)	(3)
(f) + (h) + (j)	(4)
(d)	(5)
(b) + (k)	(6)
(i)	(7)

Table 11: Mapping between old ABET student outcomes (a)-(k) and current ABET student outcomes (1)-(7).

44 Outcome (6) Summary:

The evidence from the assessment results (Table 6) shows that the threshold of attainment of this outcome was exceeded in all performance criteria assessed. Recommendation: The faculty identified no problem with this outcome, and therefore recommend no changes at this juncture.

45 Outcome (7) Summary:

The evidence from the assessment results (Table 7) shows that the threshold of attainment of this outcome was exceeded in all performance criteria assessed. Recommendation: The faculty identified no problem with this outcome, and therefore recommend no changes at this juncture.

5 Rubrics

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