– Electronics Engineering Technology –
2020-21 Assessment Report

Aaron Scher

Electrical Engineering & Renewable Energy Department

Contents

1 Introduction

1.1 Background

The BS Electronics Engineering Technology (BSEET) program is offered by the Electrical Engineering & Renewable Energy (EERE) department. The BSEET program is designed to prepare graduates to assume engineering and technology positions in the electronics industry. The engineering topics included in the BSEET program provide students with a strong foundation in the fundamental areas of electronics engineering, including circuits, analog electronics and solid state devices, digital circuits and systems, microcontrollers and embedded systems, linear systems and DSP, communication systems, and computer programming. To increase flexibility the program includes some technical elective courses. Engineering design is emphasized in most engineering courses. The broad education component of the program is provided through the general education curriculum, which includes courses in communication, humanities, social sciences, and management. This helps reinforce some of the program outcomes, such as effective communication with a range of audiences and functioning effectively on teams. The BSEET program culminates with a three-term capstone design project. This year-long project is intended to encompass a significant design experience incorporating appropriate engineering standards and multiple constraints, as well as using the knowledge and skills acquired in earlier coursework.

The BSEET degree is especially suited for working professionals with an associate's degree in Electronics Engineering Technology, Microelectronics Technology, or equivalent coursework. To meet the needs of working professionals, many courses are offered in the evenings and online. The program offers excellent transferability from numerous accredited Electronics Engineering Technology and related programs in Oregon (e.g., Portland Community College, Clackamas Community College, Chemeketa Community College, Columbia Gorge Community College, etc.). Students entering the BSEET program by transfer are requested to contact the EET Program Director concerning transfer of technical coursework, and it is recommended that students start the advising process with Oregon Tech right after they complete the first year of their A.A.S. degree. An accredited Associate of Applied Science (A.A.S.) degree in Electronics or Microelectronics and Calculus-level math is a perfect preparation to start our upper-division coursework. Alternatively, coursework on DC Circuit Analysis, AC Circuit Analysis, Combinational Logic (Digital Circuits), Sequential Logic (Digital Circuits), Semiconductor Devices, and other technical and general education courses provides adequate preparation.

1.2 Program Location

The BSEET program is located at the Oregon Tech Portland-Metro campus, which is an urban non-residential campus located in Wilsonville, on the south of the greater Portland metro area, 15 miles south of downtown Portland. The campus is situated in a wooded business park setting among several technology companies, and offers excellent access to internships and other technological collaborations with the Silicon Forest (as the semiconductor industry in the Portland metropolitan area is known).

1.3 Program History

The BSEET program at Oregon Tech was first accredited by ABET in 1970. The last two on-site ABET accreditation visits took place in Fall 2014 and Winter 2021.

The Oregon Institute of Technology has offered a Bachelor of Science in Electronics Engineering Technology (BSEET) degree since 1970. The EET program served a need in the state for many years and was successful and highly regarded. Since the 1990's industries' needs began to shift more towards hiring graduates of full electrical engineering programs and the BSEET program started to experience significant enrollment declines. A department committee, in consultation with the industry advisory board, recommended that the program change from EET to EE in Klamath Falls, but continue as the BSEET program at OIT-Portland to continue serving degree completion students and working professionals with A.A.S. EET degrees. Once the decision to discontinue the BSEET program from Klamath Falls was made, the BSEET program underwent a major revision in order to optimize it to address the needs of working professionals and transfer students at OIT-Portland. These revisions were approved by the Curriculum Planning Commission (CPC) in 2008. In 2011, a decision was made by the department, in consultation with the industry advisory board, to enhance the upper division EET curriculum by converting some of the EET courses to traditional EE courses with a strong lab component. This change was implemented to better achieve the program educational objectives of preparing graduates to assume diverse roles in the engineering and engineering technology fields, as well as improve their access to graduate education. These changes were approved by the Curriculum Planning Commission (CPC) in 2011 and implemented in the 2011-12 academic year.

In Fall 2012 the Oregon Tech Portland-Metro (Wilsonville) campus opened as a result of the consolidation of the university's four Portland-Metro area sites. The BSEET courses are offered at the Portland-Metro (Wilsonville) campus, and continue to accommodate professionals working in high-tech industry in the Portland-Metro area. The BSEET program also has strong relationships with industry, particularly through its program-level Industry Advisory Board and alumni from the EET program. These relationships support continuing partnerships with industry leaders to ensure that our program and classes are at the top of the board with adapting to new technology and preparing students for workforce demands.

1.4 Program Constituencies and Industry Relationships

To maintain a program that is current with the needs of industry and of sufficient technical rigor requires input from many different constituents. Some of the constituents are industrial and some academic. The various constituents that are used in the program assessment process include BSEET graduates and students, Industry Advisory Board (IAB) members, employers and faculty. Input from these constituents is gathered and reviewed in a periodic manner to ensure the PEOs remain aligned with the direction of industry, as well as the university's mission and resources.

The IAB provides advice and counsel to the EET 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.

The IAB and the program faculty meet once or twice per year (typically Fall and Spring terms). At these meetings, faculty have an opportunity to provide and update on the state

of the department and its programs, as well as receiving input and feedback from the IAB on any new departmental initiatives in light of the current industry trends and needs. The IAB periodically reviews the program PEOs and SOs to ensure they remain relevant and responsive to the needs of industry. Program changes are also reviewed by the IAB before implementation.

1.5 Program Enrollment and Salary Data

Table 1 presents program enrollment data from Fall 2016 to Fall 2020. Table 2 shows the number of BSEET 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 employment six months after graduation).

Table 1: BSEET enrollment in the last five academic years (headcount of both full and part-time students in week 4 of the Fall term)

2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
32	14	18	20	17

Table 2: Number of BSEET degrees awarded for the last five academic years

2016-2017	2017-2018	2018-2019	2019-2020	2020-2021
4	6	1	2	3

2 Program Mission, Educational Objectives, and Outcomes

2.1 Program Mission

The mission of the EET 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 electronics. The department will be a leader in providing career ready candidates for various electronics technology fields. 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 (PEOs) for the BSEET program are:

1. The graduates of the program will possess a strong technical background as well as analytical and problem solving skills, and will contribute in a variety of technical roles within the electronics and high-tech industry. Within three years of graduation,

BSEET graduates are expected to be employed as test engineers, characterization engineers, applications engineers, field engineers, hardware engineers, process engineers, and similar engineering technology positions within this industry.

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

3. The graduates of the program will be committed to professional development and lifelong learning by engaging in professional and/or graduate education in order to stay current in their field and achieve continued professional growth.

2.3 Relationship Between Program Educational Objectives and Institutional Mission Statement

The Oregon Tech mission statement is as follows:

> Oregon Institute of Technology ("Oregon Tech"), Oregon's public polytechnic university, offers innovative, professionally-focused undergraduate and graduate degree programs in the areas of engineering, health, business, technology, and applied arts and sciences. To foster student and graduate success, the university provides a hands-on, project-based learning environment and emphasizes innovation, scholarship, and applied research. With a commitment to diversity and leadership development, Oregon Tech offers statewide educational opportunities and technical expertise to meet current and emerging needs of Oregonians as well as other national and international constituents.

The mission statement was approved by the Oregon Tech Board of Trustees on May 30, 2019 and reviewed by the Higher Education Coordinating Commission (HECC) on August 8, 2019.

The BSEET PEOs are in alignment with the university's mission. Specifically, PEO1 relates to graduates having a strong technical background as well as analytical and problem solving skills that will allow them to succeed within the electronics and high-tech industry. This links to the university's mission of offering "innovative, professionally-focused undergraduate and graduate degree programs in the areas of engineering, health, business, technology, and applied arts and sciences."

PEO2 focuses on graduates being effective collaborators and communicators, assuming technical and managerial leadership roles throughout their careers. This is consistent with the university's mission to be committed to leadership development.

PEO3 has a focus on professional development and lifelong learning so that graduates will stay current in the evolving field of electrical engineering. These PEOs are in alignment with the university's mission to meet current and emerging needs.

2.4 Program Student Outcomes

The student outcomes (SOs) of the BSEET program correspond to the ABET ETAC (1)-(5) student outcomes. At the time of graduation, BSEET students must demonstrate:

1) (**Problem Solving**) 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;

2) (**Design**) an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;

3) (**Communicaiton**) 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;

4) (**Experimentation**) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and

5) (**Teamwork**) an ability to function effectively as a member as well as a leader on technical teams.

A mapping between the ABET ETAC (1) - (5) outcomes and the courses in the BSEET program are presented in Appendix A. We note that the outcomes are attained and reinforced throughout the curriculum.

2.5 Relationship between PEOs and SOs

The mission and program educational objectives (PEOs) describe the capabilities of the graduates after they have entered their chosen career. The student outcomes (SOs) are used to develop the necessary foundation of knowledge and skills that a graduate will need to accomplish these objectives as they mature in their disciplines. It is the student outcomes that allow graduates to excel at the educational objectives.

Table 3 shows a map of the BSEET student outcomes to the program education objectives. As the table indicates, the student learning outcomes correlate strongly with the education objectives, with each SO mapping to at least one PEO.

Table 3: Mapping between BSEET SOs (1)-(7) and PEOs

Student Outcome	PEO1	PEO2	PEO3
(1) Problem Solving	X	X	X
(2) Design	X		
(3) Communication	X	X	X
(4) Experimentation	X	X	X
(5) Teamwork	X	X	

2.6 Process for Establishment and Revision of PEOs and SOs

The PEOs were developed by the program faculty in consultation with the IAB. The BSEET student outcomes were set in accordance to the current ABET criteria (Criterion 3) for accrediting engineering programs. The BSEET SOs include ABET ETAC outcomes (1)-(5), which are the general outcomes for all baccalaureate engineering technology programs.

The PEOs and SOs are periodically reviewed to ensure they stay relevant. The revision process involves different constituents. At the annual EERE Convocation meeting in the

Fall, the EERE faculty have an opportunity to review the PEOs and SOs for each program in light of the results from the assessment activities conducted the previous year (i.e., direct assessments collected in program courses, as well as indirect assessment from senior exit survey), results of graduate surveys provided by Career Services, the input gathered from IAB members and employers during the previous academic year, as well as any changes to the institutional or college mission, or the ABET criteria (if any have occurred). Based on the discussion, the EERE faculty may approve to make no changes to the program SOs or make recommendations for proposed changes. The results are determined by a simple majority vote.

During the academic year, one or two meetings are held with the IAB (typically Fall and Spring). These meetings provide an opportunity for faculty to present program updates, assessment results, etc., as well as gather input from the IAB to inform strategic direction of the program. If changes to the SOs have been proposed by the faculty at the Fall Convocation meeting, these are discussed with the IAB members. The IAB members may approve the changes or propose alternative changes. The results are determined by a simple majority vote.

As part of the assessment cycle, the BSEET program faculty have a Closing-the-Loop meeting. This meeting is typically scheduled in the Fall term, prior to 31 October. At this meeting, the program faculty discuss the results of the assessment activities carried out during the previous academic year and have an opportunity to review the SOs. If any changes to the SOs have been approved by the faculty and the IAB, these are announced at the Closing-the-Loop meeting and included in the annual Assessment Report, which is submitted to the Director of Assessment for the university, and if approved, the new SOs are published on the BSEET program website and submitted for inclusion in the catalog for the following academic year. Table 4 summarizes the process for review of the BSEET program student outcomes.

Table 4: BSEET PEO and SO Review Process

Event	**Task**
Convocation	EERE faculty review PEOs and SOs in light of assessment data and other feedback collected in previous academic year. Faculty may propose and approve changes to PEOs or SOs
IAB meeting	If changes to PEOs or SOs have been proposed and approved by EERE faculty, they are presented to IAB for consideration and approval or revision.
BSEET Closing the Loop (CTL) meeting	If PEO or SO changes have been approved by EERE faculty and IAB, they are announced and included in Assessment Report. New PEOs or SOs are submitted for update on the website and catalog for the following academic year.

3 Assessment of Student Outcomes (SOs)

3.1 Introduction, Methodology, and the Assessment Plan

Outcomes are to be assessed each year according to the assessment plan presented in Table 5. Outcomes (1) − (5) are assessed in ENGR 465 - Capstone Project. The capstone project is a year-long (three-term) project that students complete in their senior year, which involves a major design experience. Throughout the year, students are required to complete the definition, design, implementation, and verification of a major engineering design project. During the initial stage, students work under the supervision of their capstone project advisor to select a project of adequate scope, and submit a project proposal.The proposal typically includes an explanation of the project relevance, a project definition or specification, a timeline with major milestones, a list of resources needed to complete the project, and a projected cost analysis. Once the proposal is approved by the academic advisor, students go through the different phases of design, implementation, and verification of their project. During this time, students have regular meetings with their project advisor in order to report progress, notify of plan changes if needed, present results, and perform prototype demonstrations. Once the design, implementation, and verification process is completed, and there is a final working prototype, students are required to generate a poster for inclusion in the annual Student Project Symposium, deliver an oral presentation, and submit a formal written report. Outcome (5) is assessed in ENGR 465 - Capstone Project when applicable, as not all capstone projects are team based. To ensure this outcome (5) is assessed, this outcomes is also assessed in EE 335 - Advanced Microcontrollers using a team project that target this particular outcome.

Table 5: BSEET Outcome Assessment Plan for the ABET (1) − (5) Outcomes

Outcome	Course	Assignment type
(1) Problem solving	ENGR 465	Capstone project
(2) Design	ENGR 465	Capstone project
(3) Communication	ENGR 465	Capstone project
(4) Experimentation	ENGR 465	Capstone project
(5) Teamwork	ENGR 465/EE 335[a]	Capstone/Team project

[a]Other upper-division EE courses may be used for assessing Outcome (5).

A systematic, rubric-based process is then used to assess the level of attainment of a given program outcome, based on a set of performance criteria. The work produced by each student is evaluated 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.

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 associated with that outcome are evaluated by the faculty, and based on the evidence, the faculty decides the adequate course of action. The possible courses of action are these:

- Collect more data (if there is insufficient data to reach a conclusion as to whether the outcome is being attained or not).

- 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).

- 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 BSEET 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 and discussed with all the department faculty, as well as with the Industry Advisory Board. If approved, these changes are submitted to the Curriculum Planning Commission and updated in the catalog for the following academic year.

In addition to the Student Outcomes (SOs) 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 Committee of the Assessment Commission. More information on institutional assessment is presented in section 5 (Institutional Assessment).

3.2 Direct Assessment

Table 6 summarizes the performance of students for each of the assessed Student Outcomes (SOs) and reports the number of students performing at a 1-developing, 2-accomplished, and 3-exemplary level for each performance criteria. The table also indicates the course instructors who performed the assessments. The rubrics used in this assessment are presented in Appendix B.

Outcomes $(1) - (4)$ were assessed in ENGR 465 - Capstone Project. The capstone project is a year-long (three-term) project that students complete in their senior year, which involves a major design experience. Throughout the year, students are required to complete the definition, design, implementation, and verification of a major engineering design project. During the initial stage, students work under the supervision of their capstone project advisor to select a project of adequate scope, and submit a project proposal.The proposal typically includes an explanation of the project relevance, a project definition or specification, a timeline with major milestones, a list of resources needed to complete the project, and a projected cost analysis. Once the proposal is approved by the academic advisor, students go through the different phases of design, implementation, and verification of their project. During this time, students have regular meetings with their project

advisor in order to report progress, notify of plan changes if needed, present results, and perform prototype demonstrations. Once the design, implementation, and verification process is completed, and there is a final working prototype, students are required to generate a poster for inclusion in the annual Student Project Symposium, deliver an oral presentation, and submit a formal written report.

Outcome (5) was assessed in EE 335 - Advanced Microcontrollers using a team project that involves students working in a team to design and test a small robot car with line tracking and object avoidance capabilities. The work was divided into five group lab projects; each project focused on a different robot sub-system (wireless communications, motor drive, speed feedback, servo control, and position feed-back).

Table 6: Summary of BSEET direct assessment for AY2020-21.

	1-Developing	2-Accomplished	3-Exemplary
(1) Problem solving - Douglas ENGR 465 - Capstone Project (N=3)			
1 - Apply mathematics	1	2	0
2 - Apply science, engineering, tech	1	1	1
2 - Apply modern tools	1	0	2
(2) - Design - Douglas ENGR 465 - Capstone Project (N=3)			
1 - Define	1	0	2
2 - Design and implement	1	1	1
3 - Characterize and evaluate	1	1	1
(3) - Communication - Douglas ENGR 465 - Capstone Project (N=3)			
1 - Written	2	0	1
2 - Oral	2	0	1
3 - Graphical	2	0	1
4 - Technical literature	1	1	1
5 - Audience	2	0	1
(4) - Experimentation - Douglas ENGR 465 - Capstone Project (N=3)			
1 - Conduct experiments	1	1	1
2 - Analyze and interpret	1	1	1
3 - Apply to improve processes	1	1	1
(5) - Teamwork - Douglas EE 335 - Adv. Microcontrollers (N=7)			
1 - Participation	3	2	2
2 - Communication	1	4	2
3 - Decision making	3	2	2
4 - Management	3	3	1

3.3 Indirect Assessment

In addition to direct assessment measures, the student outcomes (1) - (5) are indirectly assessed through a senior exit survey each year. For AY 2020-2021, the number of BSEET

graduates was very low and no exit survey responses were received with respect to the student outcomes. The BSEET Program Director has brought this issue to the attention of the Office of Academic Excellence and Assessment.

4 Continuous Improvement

The BSEET faculty met in October 2021 to review the assessment results and determine whether any changes are needed to the BSEET curriculum or assessment methodology based on the results presented in this document. The 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 BSEET faculty is to have at least 80% of the students perform at the level of accomplished or exemplary in all performance criteria of the assessed outcomes. Because of the low sample size, the statistical power of the present results are limited. To generate a larger sample size, the faculty intends to combine together data collected over a number of years to provide a more accurate view and better allows for general inferences and conclusions. Figure 1 presents a summary of all assessment results collected between AY 2019-20 to present. The faculty have been informed of the results and our intent to continue collecting data to form a larger sample size.

Our data obtained through direct assessment (see Table 6) for this year shows a concern in outcomes (3) Communication and (5) Teamwork. One reason for these results could likely be that all courses were taught remotely due to the COVID-19 pandemic. This also made collecting assessment data more challenging on the faculty, especially for assessing Outcome (5) Teamwork. In response to these results, courses in the curriculum with team projects like EE 321 Electronics I and ENGR 465 Capstone will more emphasize skills needed for successful remote teamwork and collaboration. A technical report will also be added to EE 320 (which EET transfer students typically take their first term in Oregon Tech) that sets clear expectations and allows for earlier feedback on student learning outcomes associated with outcome (3) Communication.

	2019-20			2020-21			Total			Percentage at A and E
OUTCOME	**D**	**A**	**E**	**D**	**A**	**E**	**D**	**A**	**E**	
(1) Problem solving										
1. Math	0	2	0	1	2	0	1	4	0	80%
2. Science/engr/tech	0	1	1	1	1	1	1	2	2	80%
3. Modern tools	0	0	2	1	0	2	1	0	4	80%
(2) Design										
1. Define	0	0	2	1	0	2	1	0	4	80%
2. Design/implement	0	1	1	1	1	1	1	2	2	80%
3. Charact./evaluate	0	1	1	1	1	1	1	2	2	80%
(3) Communicaiton										
1. Written	0	0	2	2	0	1	2	0	3	60%
2. Oral	0	1	1	2	0	1	2	1	2	60%
3. Graphical	0	2	0	2	0	1	2	2	1	60%
4. Tech. Literature	0	2	0	1	1	1	1	3	1	80%
5. Audience	0	1	1	2	0	1	2	1	2	60%
(4) Experimentation										
1. Conduct	0	0	2	1	1	1	1	1	3	80%
2. Analyze/interpret	0	1	1	1	1	1	1	2	2	80%
3. Improve process	0	1	1	1	1	1	1	2	2	80%
(5) Teamwork										
1. Participation	0	1	0	3	2	2	3	3	2	63%
2. Communication	0	0	1	1	4	2	1	4	3	88%
3. Decision making	0	1	0	3	2	2	3	3	2	63%
4. Management	0	1	0	3	3	1	3	4	1	63%

Legend: **D = Developing**
A = Accomplished
E = Exemplary

Figure 1: Summary of assessment results from AY 2019-20 to present.

5 Institutional Assessment

In addition to program-level student outcomes, Oregon Tech has defined and regularly assesses university-wide student outcomes. These are commonly referred to as Institutional Student Learning Outcomes (ISLOs) and are linked to the general education requirements which are common to all majors. A description of the ISLOs can be found at https://www.oit.edu/academic-excellence/GEAC/essential-studies/ISLO.

5.1 Relationship between programmatic SOs and institutional ISLOs

Oregon Tech's ISLOs support the university's mission. They reflect the common expectations about the knowledge, skills, and abilities that Oregon Tech students will acquire and are reflected in the General Education requirements that lay the foundation upon which the major curricula build. Engaging in these ISLOs will support Oregon Tech graduates in developing the habits of mind and behaviors of professionals and lifelong learners.

institutional student Learning Outcomes: Oregon Tech students will

- (ISLO1) **communicate** effectively orally and in writing;

- (ISLO2) engage in a process of **inquiry and analysis**;
- (ISLO3) make and defend reasonable **ethical judgements**;
- (ISLO4) collaborate effectively in **teams** or groups;
- (ISLO5) demonstrate **quantitative literacy**;
- (ISLO6) explore **diverse perspectives**.

Each of the BSEET SOs align well with an ISLO, which facilitates the coordination of assessment and continuous improvement efforts at the program and institutional level. Table 7 shows a map of the BSEET student outcomes to the ISLOs. As the table indicates, the student learning outcomes correlate strongly with the ISLOs, with each SO mapping to at least one ISLO. Note that ISLO3 (ethical judgements) does not have a corresponding SO, and will be assessed independently from the SOs.

Table 7: Mapping between BSEET SOs (1)-(7) and ISLOs

Student Outcome	**ISLO1:** Communication	**ISLO2:** Inquiry and Analysis	**ISLO3:** Ethical Judgements	**ISLO4:** Teamwork	**ISLO5:** Quantitative Literacy	**ISLO6:** Diverse perspectives
(1) Problem Solving		X				
(2) Design						X
(3) Communication	X					
(4) Experimentation					X	
(5) Teamwork				X		

5.2 Mapping of BSEET Curriculum to SOs and ISLOs

Table 8 shows the mapping of the BSEET curriculum to the student outcomes (SOs) (1)-(7), as well as the six institutional ISLOs. For each course, the table indicates whether the outcome is covered at the foundational (F), practice (P), or capstone (C) level. In the case of electives, the student outcomes covered are dependent on the specific elective course selected by the student. They have been marked with X.

Table 8: Mapping between BSEET courses and student outcomes

BSEET Student Outcomes (SOs)	(1)	(2)	(3)	(4)	(5)	
ISLOs	ISLO2	ISLO6	ISLO1	ISLO5	ISLO4	ISLO3
BSEET Curriculum						
Communication						
SPE 111: Public Speaking			F		F	
SPE 321: Small Group & Team Comm.			P		P	
WRI 121: English Composition			F			
WRI 227: Technical Report Writing	F		P			
WRI 3xx/4xx: Adv. Writing Elective	P		C	F	F	
Math/Science						
MATH 111: College Algebra	F					
MATH 112: Trigonometry	F					
MATH 251: Differential Calculus	P					
MATH 252: Integral Calculus	P					
MATH 254: Vector Calculus I	P					
MATH 321: Applied Differential Eq. I	P					
MATH 361: Statistical Methods 1	P					
PHY 221: General Physics w/ Calculus	F			F	F	
PHY 222: General Physics w/ Calculus	P			F	F	
PHY 223: General Physics w/ Calculus	C			F	F	
Programming						
CST 116: C++ Programming I	F					
ENGR 267: Engineering Programming	P					
Electrical and Electronics Engineering						
EET Electives (varies)	X	X	X	X	X	X
EE 219 Intro to Semic. Dev. and Amplifiers	F					
EE 131: Digital Electronics I	F	F		F	F	
EE 133: Digital Electronics II	F	P		F	F	
EE 121: Fund. of Electric Circuits I	F		F	F	F	

Table 8: Mapping between BSEET courses and student outcomes

BSEET Student Outcomes (SOs)	(1)	(2)	(3)	(4)	(5)	
ISLOs	ISLO2	ISLO6	ISLO1	ISLO5	ISLO4	ISLO3
EE 123: Fund of Electric Circuits II	F		F	F	F	
EE 320: Adv. Circuits and Systems Analysis	P	F	P	P	P	
EE 321: Electronics I	P	F	P	P	P	
EE 323: Electronics II	P	P	P	P	P	
EE 325: Electronics III	C	C	C	C	P	
EE 331: Digital Sys. Design w/ HDL	P			F		
EE 333: Microcontroller Engineering	P	P		P	P	P
EE 335: Adv. Microcontroller Eng.	C	C	P	C	C	P
EE 341: Elec. and Mag. w/ Trans. Lines	P			P		
EE 3432: Advanced Digital System Design	C	C	P	P	P	
EE 401: Communication Systems	C			P		
EE430: Linear Systems & DSP	C	F				
Engineering Electives (varies)	X	X	X	X	X	X
ENGR465: Capstone Project	C	C	C	C	C	C
Business and General Education						
MGT 345: Engineering Economy		F				P
Humanities Electives (varies)	X	X	X	X	X	X
Social Science Electives (varies)	X	X	X	X	X	X

5.3 Results of ISLO Assessment

Table 9 shows the assessment cycle for the institutional ISLOs. Institutional assessment was previously conducted separately from program assessment, with the programs submitting their raw assessment data to the Office of Academic Excellence, and the Executive Assessment Commission scoring the data and generating an institutional assessment report with the data from all programs. In order to streamline the process and increase synergy between institutional and program-level assessment, the Office of Academic Excellence asked programs to start conducting the ISLO assessment for their programs and include institutional ISLO assessment results directly in their programmatic assessment reports.

As discussed previously, each of the BSEET SOs align well with an ISLO (see Table 7). This allows ISLO assessment to be coordinated with SO assessment to facilitate coordination and streamline the assessment process. The only exception to this one-to-one

correspondence is ISLO3 (ethical judgements), which does not have a corresponding SO, and will be assessed independently from the SOs.

Per Table 9, the institutional level ISLO outcomes assessed in AY2020-21 include: **(ISLO2) Inquiry and Analysis**, and **(ISLO5) Quantitative Literacy**. ISLO2 maps to programmatic SOs (1) and ISLO5 maps to programmatic SO (6). The assessment of ISLO2 and ISLO 5 was conducted using the data from SOs (1) and (6), respectively, collected in the last two years, as indicated in the table.

Table 10 shows the institutional assessment results. The numbers represent the percentage of students scoring a 2 (accomplished) or 3 (exemplary) in the outcome (averaged all performance criteria). To increase sample size, the data has been collected over the past two years. Due to the lack of BSEET students completing the senior exit survey, indirect assessment data is not available (NA).

Table 9: Institutional ISLO Assessment Cycle.

Student Outcome	**2019-20**	**2020-21**	**2021-22**
ISLO1: Communication			X
ISLO2: Inquiry and Analysis		X	
ISLO3: Ethics			X
ISLO4: Teamwork			X
ISLO5: Quantitative Literacy		X	
ISLO6: Diverse Perspectives	X		

Table 10: Summary of assessment for ISLOs scheduled for the AY2020-21 cycle institutional assessment cycle.

	Direct	**Indirect**
ISLO2: Inquiry and Analysis		
(1) Problem Solving	N = 5 80%	N = 0[a]
ISLO5: Quantitative Literacy		
(4) Experimentation	N = 5 80%	N = 0[a]

[a] None of the three BSEET graduates completed the annual student exit survey. This issue has been reported to the Office of Academic Excellence.

Recommendation: The results presented inTable 10 will be reported to the Office of Academic Excellence.

5.4 Degree Completion, Retention and Equity Data

The university has recently started tracking equity data as part of an initiative to identify and close equity gaps. To this end, the university has developed several dashboards that allow to track the 6-year graduation rates as well as the 1-year retention dates, and to sort this data along different demographic categories such as gender, race and socio-economic status.

Figure 2 shows the 6-year degree completion rates for students starting their degree in Fall 2011 through Fall 2015. Figure 3 shows the 4th term retention rates for students starting at Oregon Tech in Fall 2015 through Fall 2019. The 4th term retention rate represents the proportion of students who were still enrolled at Oregon Tech four terms after their start term (excluding Summer term). Both sets of data are presented for three student populations: (1) BSEET students, (2) College of ETM students, and (3) all Oregon Tech students. By overlapping these three populations, we can identify whether there are trends that pertain specifically to BSEET students, or whether they follow the overall college or university trend.

Due to the low enrollment (small sample size) it is difficult to extract meaningful information with respect to how the BSEET trends compare with those of the College of ETM and Oregon Tech. For example, Figure 3 shows a BSEET 4th-term retention rate for 2017 of 100%. While a 100% retention rate certainly looks impressive, the BSEET headcount in the 1st term (Fall) of 2017 was only 2 students.

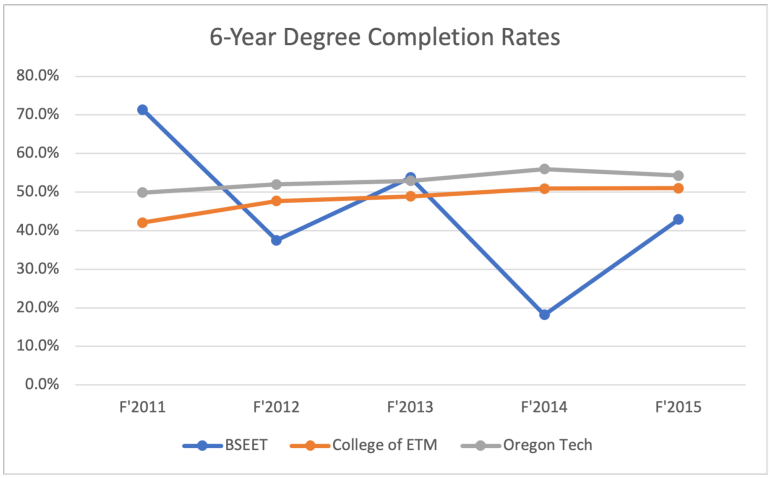

Figure 2: 6-year completion rates for students who started at Oregon Tech in Fall 2011 through Fall 2015.

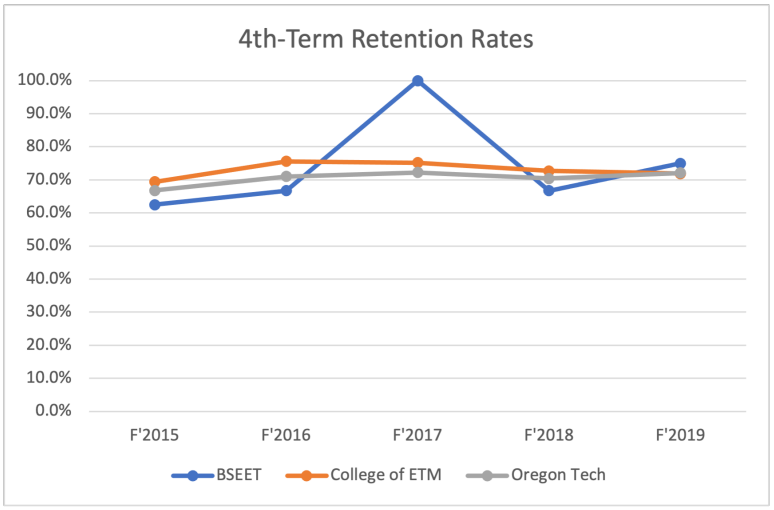

Figure 3: 4th term retention rates for students who started at Oregon Tech in Fall 2015 through Fall 2019.

From the current dashboards, it was difficult to extract meaningful information regarding equity in the degree completion and retention rates. The first problem is the low student enrollment. The second problem is that the data is currently displayed as absolute numbers, instead of proportions or percentages. For example, out of the 7 students who started their BSEET degree in Fall 2015, 3 students graduated in 6 years. Per the dashboard, 0 out of these 3 were classified as "female" and 3 as "male". Since the composition of the BSEET student body is not symmetrical with regards to gender (with males significantly outnumbering females), it is expected that the absolute number of males completing their degree within 6 years will exceed the number of females.

Without knowing the male:female proportion in the original cohort of 7 students, it is difficult to establish whether there is an equity gap between the degree completion rates based on gender. This same principle applies to all equity categories. To ensure that we can extract meaningful information related to equity gaps, we have made the recommendation to the Executive Assessment Commission that the dashboards be modified to report proportions or percentages of the overall population in the equity data tables, instead of the absolute numbers that are currently being reported.

A Rubrics for direct assessment

The following rubrics are used by the program faculty for direct assessment of student outcomes. To promote consistency and reliability of assessment results, all faculty assessing a particular outcome use the same rubric.

ETAC RUBRIC: OUTCOME 1 – APPLICATION

Outcome (1): 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.

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
AN ABILITY TO APPLY MATHEMATICS TO BROADLY-DEFINED ENGINEERING PROBLEMS	Inadequate ability to apply mathematic principles from algebra, trigonometry, calculus, differential equations, and/or statistics to the solution of engineering broadly-defined problems appropriate to electronics technology.	Adequate ability to apply mathematic principles from algebra, trigonometry, calculus, differential equations, and/or statistics to the solution of engineering broadly-defined problems appropriate to electronics technology.	Exceptional ability to apply mathematic principles from algebra, trigonometry, calculus, differential equations, and/or statistics to the solution of broadly-defined engineering problems appropriate to electronics technology.	
AN ABILITY TO APPLY SCIENCE, ENGINEERING, AND TECHNOLOGY TO BROADLY-DEFINED ENGINEERING PROBLEMS	Inadequate ability to apply science, engineering, and technology principles to the solution of engineering problems broadly-defined appropriate to electronics technology.	Adequate ability to apply science, engineering, and technology principles to the solution of engineering broadly-defined problems appropriate to electronics technology.	Exceptional ability to apply science, engineering, and technology principles to the solution of broadly-defined engineering problems appropriate to electronics technology.	
AN ABILITY TO APPLY MODERN TOOLS TO BROADLY-DEFINED ENGINEERING TECHNOLOGY PROBLEMS	Inadequate ability to apply modern tools such as circuit layout and simulation CAD tools and/or standard electronic test equipment for test and validation to the solution of broadly-defined engineering problems.	Adequate ability to apply modern tools such as circuit layout and simulation CAD tools and/or standard electronic test equipment for test and validation to the solution of broadly-defined engineering problems.	Exceptional ability to apply modern tools such as circuit layout and simulation CAD tools and/or standard electronic test equipment for test and validation to the solution of broadly-defined engineering problems.	

*As defined by ABET, broadly-defined activities or problems are practical, broad in scope, relatively complex, and involve a variety of resources; use new processes, materials, or techniques in innovative ways; and may require extension of standard operating procedures.

Outcome (2): an ability to design systems, components, or processes meeting specified needs for broadly-defined* engineering problems appropriate to the discipline.

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
AN ABILITY TO DEFINE AND CONTEXTUALIZE THE PROJECT	Demonstrates inadequate ability to define the project. Does not properly identify the problem to be solved, its relevance and context. Weak problem definition. Criteria are vague, subjective, or not relevant. Specifications and constraints are insufficient or unclear.	Demonstrates adequate ability to define the project. Properly identifies the problem to be solved, its relevance and context. Problem is adequately defined in engineering terms. Appropriate objective criteria are used. Specifications and constraints are clear and sufficient.	Demonstrates exceptional ability to define the project. Clearly identifies problem to be solved, and explains its relevance and context thoroughly and effectively. Problem is clearly defined in engineering terms. Criteria are objective, relevant and adequately prioritized based on context. Specifications and constraints are clear and allow to thoroughly evaluate the effectiveness of the proposed solution in solving the problem.	
AN ABILITY TO DESIGN AND IMPLEMENT ENGINEERING SYSTEMS, COMPONENTS, OR PROCESSES	Demonstrates inadequate ability for engineering design: • Selects preliminary design based on criteria that are not well aligned with design specifications and constraints. • Describes design solution without articulated scientific or engineering principles. • Does not use iterative modifications in a systematic way to improve design. • Rudimentary use of engineering tools and methods in the design process. • Design meets some but not all specs/constraints.	Demonstrates adequate ability for engineering design: • Provides subjective justification for preliminary design which aligns with design specifications and constraints. • Describes design solution using scientific or engineering concepts and principles. • Uses iterative modifications in a systematic way to improve design. • Uses engineering tools and methods effectively in the design process. • Design meets most or all specs/constraints.	Demonstrates exceptional ability for engineering design: • Provides objective justification for preliminary design which aligns with design specifications and constraints. • Describes design solution using scientific or engineering concepts and principles with great precision. • Uses iterative modifications in a systematic and effective way to improve design. • Shows mastery of engineering tools and methods in the design process. • Design meets or exceeds all specs/constraints.	
AN ABILITY TO CHARACTERIZE AND EVALUATE DESIGN SOLUTIONS	Demonstrates inadequate ability to evaluate the performance of the design solution. Limited design characterization. Insufficient discussion of design tradeoffs/limitations. No or vague suggestions for further improvement.	Demonstrates adequate ability to evaluate the performance of the design solution. Adequate design characterization. Sufficient discussion of design tradeoffs/limitations. Reasonable suggestions for further improvement provided at a high level of generality.	Demonstrates exceptional ability to evaluate the performance of the design solution. Thorough design characterization. Detailed discussion of design tradeoffs/limitations. Good specific and detailed suggestions provided for further improvement of design.	

* As defined by ABET, broadly defined activities or problems are practical, broad in scope, relatively complex, and involve a variety of resources; use new processes, materials, or techniques in innovative ways; and may require extension of standard operating procedures.

ETAC RUBRIC: OUTCOME 3 – COMMUNICATION

Outcome (3) – an ability to apply written, oral, and graphical communication in broadly-defined* technical and non-technica environments; and ability to identify and use appropriate technical literature.

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
AN ABILITY TO APPLY WRITTEN COMMUNICATION	Presentation and format rough or inconsistent throughout the document. Content is disorganized. Ideas are not clearly presented. Frequent grammar/spelling errors, writing style is rough or imprecise.	Presentation and format is adequate and consistent throughout the document. Content is well organized and ideas are clearly presented. Grammar/spelling mostly correct, readable style.	Work is professionally presented and very well formatted. Content is very well organized and easy to follow. Ideas are clearly presented. All grammar/spelling correct, very well written.	
AN ABILITY TO APPLY ORAL COMMUNICATION	Low volume or monotonous tone makes it hard for audience to engage. Speaker mispronounces important terms. Speaker does not transmit any interest or enthusiasm about the topic. Presentation length not appropriate.	Speaker talks in a firm, clear, expressive voice. Adequate volume and dynamic tone engage audience. Speaker pronounces important terms correctly. Speaker occasionally transmits interest and enthusiasm about the topic. Adequate presentation length.	Speaker is an excellent communicator. Speaker is eloquent and dynamic, talks in a loud, clear voice, does not mispronounce important terms. Speaker displays and transmits a strong interest and enthusiasm for the topic. Adequate presentation length.	
AN ABILITY TO APPLY GRAPHICAL COMMUNICATION	Inadequate use of figures, charts, and tables to display data. Many figures, charts, and tables missing key formatting elements, such as titles, labels, units, captions, etc. Figures are not well placed, scales are not fitted to the dataset, titles/captions are incorrect or missing.	Adequate use of figures, charts, and tables to display data. A few figures, charts, and tables missing key formatting elements, such as titles, labels, units, captions, etc. Figures are well placed, scales are fitted to the dataset. Some titles/captions may be too general or unclear.	Excellent use of figures, charts, and tables to display data. All figures, charts, and tables properly labeled and formatted, easy to read and interpret, with proper titles and captions. In some instances, results offer additional information above that required.	
AN ABILITY TO IDENTIFY AND USE APPROPRIATE TECHNICAL LITERATURE	Performs an inadequate review of published material and literature to place work in context. Obvious omissions in literature search. Does not use proper format citation for references. Does not give proper credit to authors and researchers. May show instances of plagiarism. Sources are of low quality.	Performs a satisfactory review of published material and literature to place work in context. Mostly uses proper format citation for all references. Source documentation gives proper credit to authors and researchers - no instances of plagiarism. Sources are of satisfactory quality.	Performs a systematic and thorough review of published material and literature to determine what is already known, what has already been done, and to learn about the skills, techniques, and any instrumentation that are needed to accomplish project objectives. Literature review fully demonstrates understanding of topic, and places work in context. Uses proper format citation for all references. Source documentation gives proper credit to authors and researchers - no instances of plagiarism. Sources are of high quality and exceed those found in a simple web search.	

ABET ETAC RUBRIC: OUTCOME 4 – EXPERIMENTATION

Outcome (4) - an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
AN ABILITY TO CONDUCT EXPERIMENTS	Demonstrates inadequate knowledge and abilities for conducting experiments with standard equipment to collect experimental data. May not obverse lab safety and procedures.	Demonstrates adequate knowledge and abilities for conducting experiments. Able to use standard equipment to collect experimental data. May require supervision and steering in the right direction. Overall, observes lab safety plan and procedures.	Demonstrates comprehensive knowledge, exceptional abilities, and resourcefulness for conducting experiments. Selects appropriate equipment/measuring devices and methodology for conducting experiments. Demonstrates an ability to predict and overcome difficulties associated with data collection. Arrives well-prepared to conduct experiments. Observes established lab safety plan and procedures. Proposes improvements as necessary.	
AN ABILITY TO ANALYZE AND INTERPRET EXPERIMENTAL RESULTS	Demonstrates inadequate knowledge and abilities for analyzing and interpreting experimental results. Reporting methods are unsatisfactory.	Demonstrates adequate abilities for experimental data analysis, interpretation, and visualization. Able to draw some reasonable conclusions based on experimental results. Demonstrates an awareness for measurement error. Reporting methods are satisfactorily organized, logical, and complete.	Demonstrates exceptional ability for experimental data analysis, interpretation, and visualization. Able to draw insightful conclusions based on experimental results. Analyzes and interprets data using appropriate theory, accounts for measurement error into analysis and interpretation, reporting methods are well-organized, logical, and complete.	
AN ABILITY TO APPLY EXPERIMENTAL RESULTS TO IMPROVE PROCESSES.	Demonstrates inadequate knowledge and abilities for applying quantitative experimental results for decision making.	Demonstrates adequate abilities for applying experimental results to adjust a process (or propose adjustments to a process) to optimize some specified set of parameters without violating some constraint. This may include demonstrating an adequate ability to learn from and apply quantitative experimental results for decision making.	Demonstrates exceptional ability to apply experimental results to adjust a process (or propose adjustments to a process) to optimize some specified set of parameters without violating some constraint. Independently seeks additional reference material and properly references sources to substantiate analysis, learns from mistakes, errors, and wrong assumptions and formulates innovative and resourceful solutions. Demonstrates exceptional ability to learn from and apply quantitative experimental results for decision making.	

ABET ETAC RUBRIC: OUTCOME 5 – TEAMWORK

Outcome 5 – an ability to function effectively as a member as well as a leader on technical teams.				
CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
TEAM PARTICIPATION	Is sometimes absent from group meetings. Routinely comes unprepared for meetings. Rarely shares credit for success with others and accountability for team results	Rarely absent without inconveniencing the group. Contributes a fair share to the project workload. Prepares somewhat for group meetings. Occasionally shares credit for success with others and accountability for team results.	Routinely present at team meetings or work sessions Exceeds expectations in work contribution. Is prepared for the group meeting with clearly formulated ideas. Shares credit for success with others and accountability for team results.	
TEAM COMMUNICATION	Rarely uses respectful language or shows cooperative communication skills. Does not demonstrate ability and willingness to communicate with the rest of the group members regarding status updates, results, ideas.	Generally uses respectful language and shows cooperative communication skills. Demonstrates adequate ability and willingness to communicate with the rest of the group members regarding status updates, results, ideas, as well as providing some constructive critique of others' ideas and proposals.	Uses respectful language and shows advanced cooperative communication skills. Demonstrates exceptional ability and willingness to communicate with the rest of the group members regarding status updates, results, ideas, as well as providing constructive critique of others' ideas and proposals.	
TEAM DECISION MAKING	Rarely contributes to promoting group dialog. Not effective at facilitating group decisions.	Occassionally contributes to promoting group dialog. Occasionally uses conflict resolution skills.	Regularly contributes to promoting group dialog. Uses conflict resolution skills effectively. Involves all members in decision making and incorporates divergent ideas.	
TEAM MANAGEMENT	Rarely uses processes and tools for organizing and coordinating the team while working towards a common goal. Provides inadequate management of meetings with regards to time, discussion, etc. Does not provide a clear definition of tasks to be accomplished.	Adequately uses processes and tools for organizing and coordinating the team while working towards a common goal. Adequate management of meetings with regards to time, discussion, etc. Provides a clear definition of tasks to be accomplished.	Highly effective at using processes and tools for organizing and coordinating the team while working towards a common goal. Manages a meeting well with regards to time, discussions etc. Supports a clear definition of tasks to be accomplished, anticipating future needs.	