— B. S. in Electrical Engineering —

2020–21 Assessment Report

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Contents

1 Introduction

1.1 Background

The BS Electrical Engineering (BSEE) program is offered by the Electrical Engineering & Renewable Energy (EERE) department. The BSEE program is designed to prepare professionals who can perform a wide range of functions within the electrical engineering industry, while also providing solid preparation for students intending to continue to graduate school to pursue master's degrees in engineering, engineering management, MBAs, or JDs. Specifically, the BSEE program lectures and laboratories equip students with a solid theoretical foundation in math, science and engineering, as well as problem solving abilities and immediately useable practical skills.

The engineering topics included in the BSEE program provide students with a strong foundation in the fundamental areas of electrical engineering, including circuits, analog electronics and solid state devices, digital circuits and systems, microcontrollers and embedded systems, linear systems and DSP, communication systems , control systems, and computer programming. To increase flexibility the program includes some technical elective courses. Engineering design is introduced early and 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, critical thinking, ability to analyze ethical issues, and a broader understanding of social, economic, and environmental issues in a global context.

The BSEE program culminates with a three-term capstone design project. This year-long project is intended to encompass a major engineering design experience incorporating appropriate engineering standards and multiple constraints, as well as using the knowledge and skills acquired in earlier coursework.

1.2 Program History

The Bachelor of Science in Electrical Engineering (BSEE) program at the Oregon Institute of Technology (Oregon Tech) was launched in Fall 2007. The program was designed as a classical electrical engineering degree, complementing the portfolio of engineering degrees on campus, namely Civil Engineering, Mechanical Engineering, and Renewable Energy Engineering. All engineering programs at Oregon Tech are currently ABET EAC accredited. The BSEE program received its first ABET general review visit and accreditation in 2012. The last ABET general review visit took place in 2016. At that time, no deficiencies or weaknesses were identified. The next ABET general review visit is scheduled for AY2022-23.

1.3 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.

The Klamath Falls campus is a residential campus located in Klamath Falls, a city of around 40,000 residents in Southern Oregon. Nestled on the eastern slope of the Cascade Mountains, the 190-acre campus offers spectacular views, an average of 300 days of sunshine per year, and ample opportunities to enjoy the great outdoors. This location also has access to exceptional natural energy resources, such as solar and geothermal. The Oregon Renewable Energy Center (OREC) and the affiliated Geo-Heat center are located here, providing exceptional opportunities for students to gain hands-on experience in the fields of power, energy, and renewable energy.

The Portland Metro campus 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).

1.4 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 BSEE 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 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.

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 Graduation Data

Table 1 presents the BSEE program enrollment 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 employment six months after graduation).

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

	2016-17	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Klamath Falls	82	75	90	86	76
Portland Metro	115	118	104	101	85
Total	193	194	187	161	121

Table 2: BSEE degrees awarded for the last five academic years.

	2016-17	**2017-18**	**2018-19**	**2019-20**	**2020-21**
Klamath Falls	17	14	18	17	16
Portland Metro	20	25	31	16	17
Total	37	39	49	33	33

2 Program Mission, PEOs and SOs

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 (PEOs) for the BSEE program are:

1. 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.
2. The graduates of the BSEE program are expected to be employed in electrical engineering positions including (but not limited to) design engineers, test engineers, characterization engineers, applications engineers, field engineers, hardware engineers, process engineers, control engineers, and power engineers.
3. The graduates of the BSEE program will be committed to professional development and lifelong learning by engaging in professional or graduate education in order to stay current in their field and achieve continued professional growth.
4. 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.

2.3 Relationship between PEOs and Institutional Mission

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 BSEE PEOs are in alignment with the university's mission. Specifically, PEO1 relates to graduates having a strong technical background in electrical engineering, as well as analytical, critical-thinking and problem solving skills that will allow them to succeed as professionals, whereas This links to the university's mission of offering "innovative, professionally-focused degree programs" in engineering, with an emphasis on "hands-on education".

PEO2 specifies the types of careers and engineering positions that graduates of the program should be ready to fulfill, which are consistent with the needs of the electrical engineering industry in the state of Oregon and nationwide. 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 universtiy's mission to meet "current and emerging needs".

PEO4 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.

2.4 Program Student Outcomes

The student outcomes (SOs) of the BSEE program correspond to the ABET EAC (1)-(7) student outcomes. At the time of graduation, BSEE students must demonstrate:

1. (**Problem Solving**) an ability to identify, formulate, and solve engineering problems problems by applying principles of engineering, science, and mathematics
2. (**Design/Broader Factors**) 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. (**Communication**) an ability to communicate effectively with a range of audiences
4. (**Ethics**) 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. (**Teamwork**) 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. (**Experimentation**) an ability to develop and conduct appropriate experimentation, interpret data analyze and interpret data, and use engineering judgment to draw conclusions

7. (**Lifelong Learning**) an ability to acquire and apply new knowledge as needed, using learning appropriate learning strategies

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 BSEE 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 BSEE SOs (1)–(7) and PEOs

Student Outcome	PEO1	PEO2	PEO3	PEO4
(1) Problem Solving	•	•		
(2) Design/Broader Factors	•		•	
(3) Communication				•
(4) Ethics	•	•		•
(5) Teamwork		•		•
(6) Experimentation	•	•		
(7) Learning			•	

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 BSEE student outcomes were set in accordance to the current ABET criteria (Criterion 3) for accrediting engineering programs. The BSEE SOs include ABET EAC outcomes (1)-(7), which are the general outcomes for all baccalaureate engineering 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 BSEE 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 BSEE program website and submitted for inclusion in the catalog for the following academic year. Table 4 summarizes the process for review of the BSEE program student outcomes.

Table 4: BSEE 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.
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 Cycle of Assessment for Program Student Outcomes

3.1 Introduction, Methodology, and the Assessment Cycle

The BSEE faculty conducts periodic assessment of student outcomes. Assessment of program student outcomes is conducted over a three (3) year cycle, which is shown in Table 5. For each outcome, assessment data is collected via direct and indirect assessment measures.

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 Committee of the Assessment Commission. More information on institutional assessment is presented in section 5 (Institutional Assessment).

Table 5: BSEE Outcome Assessment Cycle. Bullets (•) indicate standard assessment cycle. Asterisk (*) indicates assessment moved to 2021-22 due to COVID-19 pandemic in 2020-21.

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

3.2 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 5), 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 program outcomes are evaluated as part of the course curriculum primarily by means of assignments. These assignments typically involve a short project requiring the student to apply math, science, and engineering principles learned in the course to solve a particular problem requiring the use of modern engineering methodology and effectively communicating the results.

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

mechanism that facilitates the design of engineering assignments that meet the relevant outcomes, particularly those that are more distant from traditional engineering coursework. Rather than considering how the outcomes match the assignment, the assignment is designed to map to the program outcomes.

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.

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 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); 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 BSEE 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.

3.3 Direct Assessment

Two student outcomes were assessed this year: outcome (1) problem solving, and oucome (2) design/broader factors.

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 1 - developing level, 2 - accomplished level, and 3 - exemplary level for each performance criteria, as well as the percentage of students performing at an accomplished level or above (i.e., assessed level ≥ 2).

The target attainment level for all outcomes is 80% of students at or above a level 2 (Accomplished). All direct assessment was performed using the rubrics in section 5.

3.3.1 Direct Assessment of Outcome (1) Problem solving

(1) An ability to identify, formulate, and solve engineering problems problems by applying principles of engineering, science, and mathematics.

A total of 16 BSEE students were assessed across both campuses (KF: N = 10; PM: N = 6). The results are presented in Table 6.

Klamath Falls, EE 323 Winter 2021, Amr Metwally

This outcome was assessed in EE323 - Electronics II by means of a project. Students were asked to design, build and test a transistor amplifier circuit. The expected amplifier is a multistage amplifier that may use MOSFETs and/or BJTs. Students had to detail their design procedure along with the required hardware and software to test the project. Students had to verify the performance of their amplifier circuit and present the results in a technical report.

To complete the project, students must be able to identify and formulate the problem in engineer-

ing terms (i.e., design specifications). Students must then apply principles of engineering, science and mathematics in the design and verification phases of the project.

Portland Metro, EE 323 Winter 2021, Cristina Crespo

This outcome was assessed in the final project for the EE323 - Electronics II course, which involved the design of an operational amplifier at the transistor level. Students were asked to produce two op-amp designs, using BJT and MOSFET technology, respectively. Students had to perform mathematical calculations to predict the performance of their circuits in terms of parameters such as input/output resistance, input offset voltage, input and offset currents, CMRR, PSRR, output compliance, etc. Students were expected to use LTSpice to model/simulate their circuit, then build their circuits and characterize their performance experimentally. Finally, students were asked to generate a project report including a description of their design methodology, a presentation and discussion of their results, and a comparison between the performance of the BJT and MOSFET op-amps, as well as a comparison to a benchmark such as the LM741.

This assignment required the identification and formulation of an engineering problem by means of a design specification, as well as the use of mathematical, scientific, and engineering principles to design and characterize their circuits.

Table 6: Results of direct assessment for student outcome (1) Problem Solving

Performance Criteria	**1 Developing**	**2 Accomplished**	**3 Exemplary**	**Students ≥2**
Klamath Falls, EE323, N=10				
1.1 Identify	1	4	5	90%
1.2 Formulate	0	5	5	100%
1.3 Solve	1	4	5	90%
Portland Metro, EE323, N=6				
1.1 Identify	0	2	4	100%
1.2 Formulate	0	2	4	100%
1.3 Solve	0	2	4	100%

3.3.2 Direct Assessment of Outcome (2) Design/Broader Factors

(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.

A total of 13 BSEE students were assessed at the Portland Metro campus, no assessment was conducted in K Falls (KF: N = 0; PM: N = 13). The results are shown in Table 7.

Portland Metro, EE 461 Spring 2021, Dr. Robert Melendy

A targeted direct assessment of this outcome was done in EE 461 *Control Engineering I*.

The assignment used to assess this outcome was a final, comprehensive simulation experiment. The objective of this experimental-based project was to have the students first develop a lumped-parameter state-space model for an engine-cam system using the methods they learned in this course involving second-order systems. The students' subsequent task was to examine this model in the frequency domain followed by the design of a proportional-integral-derivative (PID) controller for the purpose of optimizing stable, cam control motion. An equally important objective was to have students recognize the need for Newtonian mechanics and the in the development of an electromechanical motion controller.

To complete the assignment, students must apply engineering design to produce an engineering solution that meets specified needs.

Table 7: Results of direct assessment for student outcome (2) Design/Broader Factors

Performance Criteria	**1 Developing**	**2 Accomplished**	**3 Exemplary**	**Students ≥2**
Portland Metro, EE461, N=13				
2.1 Engineering Design	1	0	12	92%
2.2 Broader Factors	-	-	-	-%

3.4 Indirect Assessment

In addition to direct assessment measures, student outcomes were indirectly assessed through a senior exit survey of graduating students. The specific outcomes assessed by the Office of Academic Excellence in the 2020-21 Student Survey were:

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. **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.
4. **Experimentation**: An ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes;

5. **Teamwork**: An ability to function effectively as a member as well as a leader on technical teams.

The outcomes in the above list do not exactly match exactly BSEE student outcomes (1) through (7). This is due to a miscommunication between the EERE Department and the Office of Academic Excellence, which created and administered the survey. Indeed, the five outcomes listed above are the new (1) through (5) ABET ETAC outcomes (not the ABET EAC outcomes). This error has been brought to the attention of the EERE Department Chair, and it is the intention of the department to use student outcomes (1) through (7) for indirect assessment in future Senior Exit Surveys. Fortunately, as both EAC and ETAC outcomes are similar, the indirect assessment data does provide useful data for understanding the student experience and assessing the effectiveness of the BSEE program.

The following questions were posed to the BSEE graduating class for each of the outcomes listed above as part of the Senior Exit Survey:

- Q1 Rate your proficiency in the following areas
- Q2 Rate how much your experiences at Oregon Tech contributed to your knowledge, skills, and personal development in these areas

The departmental objective is to have at least 80% of participants give a rating of 2 or 3 in both questions.

A total of 14 BSEE graduating seniors completed the Senior Exit Survey. The results of the indirect assessment for Q1 and Q2 are presented in Figures 1 and 2, respectively. As Figure 1 shows, the majority of students rate their proficiency level as "3 - High proficiency" or "2 - Proficiency" in all assessed outcomes. The percentage of students scoring 2 or 3 in Q1 exceeds 80% in every outcome assessed. Similarly, Figure 2 shows that the majority of students rate that Oregon Tech contributed "3 - Very much" or "2 - Quite a bit" to their knowledge, skills, and personal development in these areas. The percentage of students scoring 2 or 3 in Q2 was slightly below the 80% goal in outcomes (1) Problem Solving (78.5%), (3) Communication (71.4%), and (5) Teamwork (78.6%). These results were discussed by the BSEE faculty at the Closing-the-Loop meeting.

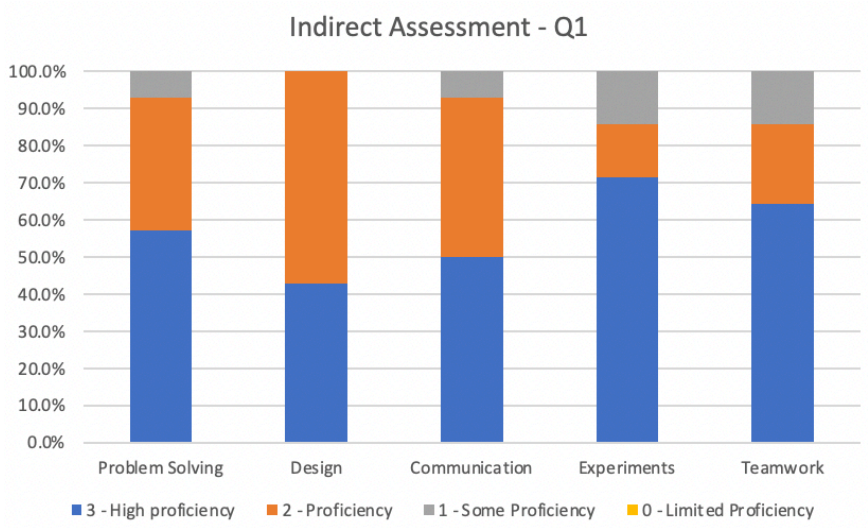

Figure 1: Results of indirect assessment, *Q1: Rate your proficiency in the following areas* (N=14)

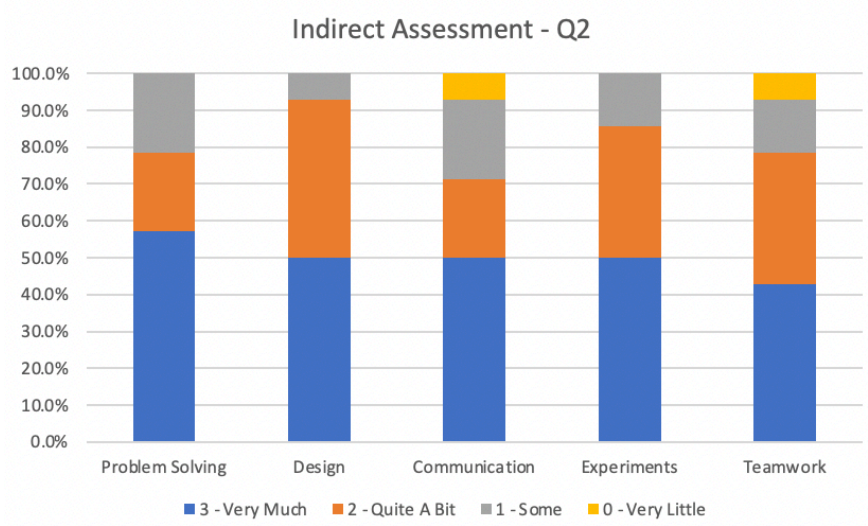

Figure 2: Results of indirect assessment, *Q2: Rate how much your experiences at Oregon Tech contributed to your knowledge, skills, and personal development in these areas* (N=14)

4 Continuous Improvement

The BSEE faculty met multiple times to review the assessment results and determine whether changes were needed to either the BSEE curriculum or the assessment methodology, based on these results. The first Closing-the-Loop meeting was held on 14 October 2021 and indicated multiple elements missing from this report. The document was updated and re-reviewed on 10 March 2022, but still found to be missing indirect assessment data. After receiving feedback from the Executive Assessment Commission, including the need to add institutional assessment data, as well as equity data to the program assessment reports moving forward, one last set of updates was made to the document and reviewed by the BSEE faculty on 9 June 2022.

4.1 Summary of Assessment Results

Table 8 shows a summary and history of results for the direct assessment of outcomes assessed in AY2020-21. The table shows the percentage of students scoring 2 (accomplished) or 3 (exemplary) in each performance criteria. These results combine the total number of students assessed within the year. In years prior to AY2018-19, old ABET outcomes (a)-(k) are matched to the new outcomes (1)-(7). More than 80% of the students were accomplished or exemplary in all criteria assessed.

The objective set by the EERE department is to have at least 80% of the students perform at the level of accomplished or exemplary in all performance criteria. The results from Table 8 show that both outcomes assessed this year were attained at this level.

Table 8: Summary and historical results of direct assessment for student outcomes assessed in AY2020-21.

	AY17–18	**AY18–19**	**AY19–20**	**AY20–21**
(1) Problem solving	$N = 31$ *outcome (e)*			$N = 16$
1.1 Identify	94%			94%
1.2 Formulate	97%			100%
1.3 Solve	87%			94%
(2) Design/Broader Factors	$N = 21$ *outcome (c)*			$N = 13$
2.1 Engineering Design	95%			100%
2.2 Broader Factors	—			—

4.2 Evaluation of Results and Continuous Improvement

Below is a summary of the discussion and recommendations made by the BSEE faculty based on the evaluation of the assessment results:

1. **Direct Assessment of Outcome (1) Problem Solving**
   Result: Outcome met.
   Discussion: No issues. Direct assessment results are consistent with historical data.
   Recommendation: No changes. Continue assessing according to cycle.
   Person in Charge/Deadline: N/A.

2. **Direct Assessment of Outcome (2) Design/Broader Factors**
   Result: Outcome partially met.
   Discussion: Outcome only partially assessed. Assignment did not cover performance criterion 1.2, and no assessment was conducted in K Falls.
   Recommendation: This outcome will be reassessed next year, ensuring both campuses and all performance criteria are covered. In order to ensure broader factors are included in assessment, outcome will be assessed in ENGR 465 - Capstone Project.
   Person in Charge/Deadline: Aaron Scher/Spring 2022.

3. **Indirect Assessment**
   Result: All outcomes attained according to Q1 (80% or more students feel proficient or highly proficient in all outcomes).
   Discussion: Incorrect outcomes were used for indirect assessment (ABET ETAC outcomes, instead of ABET EAC outcomes). This is believed to have been due to a miscommunication between the department chair and the Office of Academic Excellence, which administers the Senior Exit Survey. Since there is some correlation between ETAC and EAC outcomes, indirect data is still useful. Most notably, only 70% of students felt OIT contributed to their attaining the communication outcome. This could be due to this graduating cohort having been impacted by the COVID-19 pandemic, which forced courses to be offered online and therefore limited the ability to have oral presentations, class discussions, and similar exchanges in an in-person setting.
   Recommendation: Communicate with the Office of Academic Excellence to ensure Senior Exit Survey is corrected to include EAC outcomes next year.
   Person in Charge/Deadline: Scott Prahl/Spring 2022.

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/eslo.

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.

Essential 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**.

An initial comparison of the ISLOs to the BSEE SOs reveals good alignment between the two sets of outcomes. Both the program level and institutional level outcomes support and complement each other in a synergistic manner. This also facilitates the coordination of assessment and continuous improvement efforts at the program and institutional level. Table 9 shows a tentative map of the BSEE 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.

Table 9: Mapping between BSEE 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		&				
(2) Design/Broader Factors						&
(3) Communication	&					
(4) Ethics			&			
(5) Teamwork				&		
(6) Experimentation					&	
(7) Lifelong Learning		&				

5.2 Mapping of BSEE Curriculum to SOs and ISLOs

Table 10 shows the mapping of the BSEE 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 10: Mapping between BSEE courses and student outcomes

BSEE Student Outcomes	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ISLOs	**ISLO2**	**ISLO6**	**ISLO1**	**ISLO3**	**ISLO4**	**ISLO5**	**ISLO2**
Communication							
SPE 111: Public Speaking	F		F				
SPE 321: Small Group & Team Comm.			P		F		
WRI 121: English Composition	F		F				

Table 10: Mapping between BSEE courses and student outcomes

BSEE Student Outcomes	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ISLOs	**ISLO2**	**ISLO6**	**ISLO1**	**ISLO3**	**ISLO4**	**ISLO5**	**ISLO2**
WRI 227: Technical Report Writing	P		P				
WRI 3xx/4xx: Adv. Writing Elective	P		C				
Math/Science							
CHE 201/4: General Chemistry & Lab	F				F	F	
MATH 251: Differential Calculus	F					F	
MATH 252: Integral Calculus	P					P	
MATH 253: Sequences and Series	P					P	
MATH 254: Vector Calculus I	C					C	
MATH 321: Applied Differential Eq. I	C					C	
MATH 341: Linear Algebra I	C					C	
MATH 465: Mathematical Statistics	C					C	
PHY 221: General Physics w/ Calculus	F				F	F	
PHY 222: General Physics w/ Calculus	P				F	P	
PHY 223: General Physics w/ Calculus	C				F	C	
Math/Science Elective	P					P	
General Engr. & Programming							
CST 116: C++ Programming I	F					F	
ENGR 101: Intro. to Engineering I	F	F	F	F	F		F
ENGR 102: Intro. to Engineering II	F	F	F	F	F		F
ENGR 267: Engineering Programming	P					P	
Electrical Engineering							
EE 131: Digital Electronics I	F	F			F	F	F
EE 133: Digital Electronics II	F					F	F
EE 221: Circuits I	F		F		F	F	F
EE 223: Circuits II	F		F		F	F	F
EE 225: Circuits III	P		P		P	P	P
EE 321: Electronics I	P	F	P		P	P	P
EE 323: Electronics II	P	F	P		P	P	P
EE 325: Electronics III	C	P	C		C	C	C

Table 10: Mapping between BSEE courses and student outcomes

BSEE Student Outcomes	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ISLOs	**ISLO2**	**ISLO6**	**ISLO1**	**ISLO3**	**ISLO4**	**ISLO5**	**ISLO2**
EE 331: Digital Sys. Design w/ HDL	P					P	P
EE 333: Microcontroller Engineering	P					P	P
EE 335: Adv. Microcontroller Engr.	C	P	P	P	C	C	C
EE 341: Elec. and Mag. w/ Trans. Lines	P					P	P
EE 343: Solid-State Electronic Devices	P					P	P
EE 401: Communication Systems	C	C				C	C
EE 430: Linear Systems & DSP	C	C			C	C	C
EE 461: Control Systems Design	C					C	C
Engineering Electives (varies)	X	X	X	X	X	X	X
ENGR 465: Capstone Project	C	C	C	C	C	C	C
Business and General Education							
MGT 345: Engineering Economy		F		P		F	
Humanities Electives (varies)	X	X	X	X	X	X	X
Social Science Electives (varies)	X	X	X	X	X	X	X

5.3 Results of ISLO Assessment

Table 11 shows the assessment cycle for the institutional ISLOs, and the corresponding mapping to the programmatic SOs. 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.

In order to make the process more efficient, the BSEE program conducted a mapping of institutional ISLOs to BSEE programmatic SOs, and decided to align the BSEE program assessment cycle to the institutional assessment cycle. As shown in Table 11, there is currently a mismatch between the two cycles. The BSEE faculty have worked to map the cycles as closely as possible for AY2021-22, and effective AY2022-23 it is expected that the two cycles will be in perfect alignment.

Per Table 11, the institutional level ISLO outcomes assessed in AY2020-21 include: **(ISLO2) Inquiry and Analysis**, and **(ISLO5) Quantitative Literacy**. ISLO2 maps to programmatic SOs (2) and (7), while ISLO5 maps to programmatic SO (6). The assessment of ISLO2 was conducted using the data from SOs (2) and (7) collected in the last two years, as indicated in the table. The assessment of ISLO5 was not performed this year, but is scheduled to be performed in AY2021-22, and the results will be included in next year's assessment report.

Table 11: Institutional ISLO Assessment Cycle. Bullets (•) indicate standard ISLO assessment cycle. Asterisk (*) indicates assessment data collected for corresponding programmatic SO.

Student Outcome	**2019-20**	**2020-21**	**2021-22**
ISLO1: Communication			&
(3) Communication	(*)		
ISLO2: Inquiry and Analysis		&	
(1) Problem Solving		(*)	
(7) Lifelong Learning	(*)		
ISLO3: Ethics			&
(4) Ethics			(*)
ISLO4: Teamwork			&
(5) Teamwork			(*)
ISLO5: Quantitative Literacy		&	
(6) Experimentation			(*)
ISLO6: Diverse Perspectives	&		
(2) Design/Broader Factors		(*)	(*)

Table 12 shows the institutional assessment results for ISLO2: Inquiry and Analysis. ISLO2 maps to program SOs (1) and (7). The table shows the summative result of the direct assessment data for the two direct assessments for SO (1) described in section 3.4.1 of this report, as well as the two direct assessments for SO (7) described in the AY2019-20 assessment report. The numbers represent the percentage of students scoring a 2 (accomplished) or 3 (exemplary) in the outcome (worst case among all performance criteria). The result of the indirect assessment is the percentage of BSEE students completing the senior exit survey who reported a self-assessed level of 3 (proficient) or 4 (highly proficient) in question Q1 of the survey for SO outcome (1), as described in section 3.5 of this report.

Recommendation: Since this is the first year merging the ISLO and program SO assessment, the

Table 12: Summary of assessment for ISLOs scheduled for the AY2020-21 cycle institutional assessment cycle.

	Direct 1 Klamath Falls	**Direct 2 Portland Metro**	**Indirect Exit Survey**
ISLO2: Inquiry and Analysis			
(1) Problem Solving	N = 10 90%	N = 6 100%	Q1-1 92%
(7) Lifelong Learning (data from AY2019-20)	N=20 85%	N=5 100%	N/A -
ISLO5: Quantitative Literacy			
(6) Experimentation	Scheduled for AY2021-22		

cycles for both sets of outcomes are not synchronized. This led to having to combine assessment data from AY2019-10 and AY2020-21 to get a full set of results for ISLO2. The data for ISLO5 will be collected and reported in AY2021-22. The recommendation is to continue to work towards aligning the institutional and program asssessment cycles. It is expected that the two cycles will be aligned starting AY2022-23.

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 3 shows the 6-year degree completion rates for students starting their degree in Fall 2011 through Fall 2015. Figure 4 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) BSEE 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 BSEE students, or whether they follow the overall college or university trend.

For the 6-year degree completion rate, the BSEE program seems to follow a similar pattern to the College of ETM and the overall university, with slightly higher values in the last two years (for example, the proportion of students who started in Fall 2015 and graduated before Fall 2021

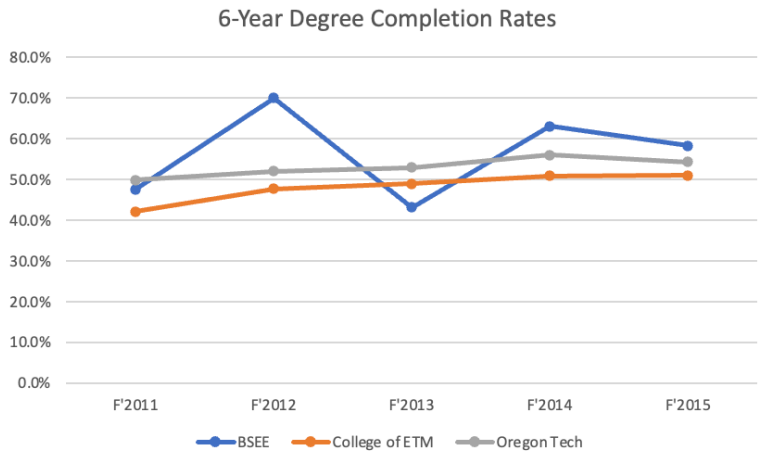

Figure 3: 6-year completion rates for students who started at Oregon Tech in Fall 2011 through Fall 2015.

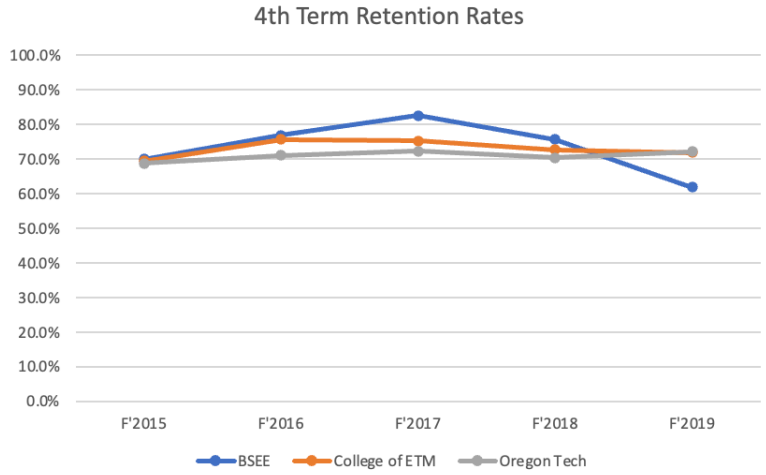

Figure 4: 4th term retention rates for students who started at Oregon Tech in Fall 2015 through Fall 2019.

is 58.3% for BSEE students, 51.0% for the College of ETM students, and 54.3% for all Oregon Tech students. The figure shows a divergence between the BSEE values and the college and university values for Fall 2012 and Fall 2013. Looking at the dashboard data, the BSEE faculty could not identify any obvious reason for this. The proportion of full-time to part-time students was similar for the five years shown, and the COVID-19 pandemic should not have affected the 6-year graduation rate for students who started their degrees in Fall 2013 (since the effects of the COVID-19 pandemic were not felt until Winter 2020). The most likely reason is that given that the represented BSEE population is much smaller in size (∼50 students) than the one for the College of ETM (∼500 students) and Oregon Tech as a whole (∼1,000 students), and therefore the data

will be more noisy (i.e., small changes in absolute values are likely to create greater deviations in the percentage).

For the 4th term retention rate, the BSEE program also follows closely the values for the College of ETM and the university. For students who started in Fall 2019, the proportion of students who were still enrolled in Fall 2020 was 61.9%, which is around 10% lower than for the other two groups. This cohort of students were immediately impacted by the COVID-19 pandemic, which started having noticeable effects in Winter 2020, the second term for this cohort. Looking at the dashboard, we identified that the 4th-term retention rate was 10% lower for BSEE students at the Portland Metro campus (55.6%) than those at the Klamath Falls campus (66.7%). It is worth noting that 20% of the Portland Metro students in the cohort were part-time students, whereas all of the Klamath Falls cohort were full-time students. Additionally, the Portland Metro student population tends to have a higher proportion of non-traditional students, who often have work and family responsibilities in addition to their school work. It is likely that the COVID-19 pandemic would have disproportionately impacted the non-traditional student population (due to disruptions at work, as well as the closure of children's schools). In fact, when we looked at the data by campus, we found that the 4th term retention rates for the College of ETM and Oregon Tech as a whole was substantially lower for Portland Metro than for Klamath Falls students, which is consistent with our previous observation.

From the current dashboards, it was difficult to extract meaningful information regarding equity in the degree completion and retention rates. The main problem is that the data is currently displayed as absolute numbers, instead of proportions or percentages. For example, out of the 48 students who started their BSEE degree in Fall 2015, 28 students graduated in 6 years. Per the dashboard, 5 out of these 28 were classified as "female" and 23 as "male". Since the composition of the BSEE 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 48 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.

6 Rubrics

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.

EAC RUBRIC: OUTCOME (1) – PROBLEM SOLVING

Outcome (1) An ability to identify, formulate, and solve complex engineering problems[1] by applying principles of engineering, science, and mathematics

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
ABILITY TO IDENTIFY A COMPLEX ENGINEERING PROBLEM	An engineering problem is not identified, or the identification is too vague or unclear.	An engineering problem of reasonable complexity is adequately identified and its significance minimally explained.	A complex engineering problem is properly identified and clearly stated. Its significance is thoroughly explained.	
ABILITY TO FORMULATE A COMPLEX ENGINEERING PROBLEM BY APPLYING PRINCIPLES OF ENGINEERING, SCIENCE AND MATHEMATICS	A complex engineering problem is not properly formulated in engineering, scientific, and/or mathematical terms. Most of the assumptions and specifications are either missing or unclear.	A complex engineering problem is adequately formulated in engineering, scientific, and/or mathematical terms, but some of the assumptions and specifications may be missing or not clearly presented.	A complex engineering problem is clearly formulated with a valid and complete set of assumptions and specifications.	
ABILITY TO SOLVE A COMPLEX ENGINEERING BY APPLYING PRINCIPLES OF ENGINEERING, SCIENCE AND MATHEMATICS	The solution to a complex engineering problem is not developed according to engineering, scientific, and mathematical principles, or it does not follow the original set of assumptions and specifications.	The solution to a complex engineering problem is developed according to engineering, scientific, and mathematical principles. The solution reasonably meets most of the original set of assumptions and specifications.	The solution to a complex engineering problem is very well developed according to engineering, scientific, and mathematical principles. The solution meets or exceeds the original set of assumptions and specifications.	

[1] As defined by ABET, complex engineering problems include one or more of the following characteristics: involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.

EAC RUBRIC: OUTCOME (2) – BROADER FACTORS

Outcome (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

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
ABILITY TO APPLY ENGINEERING DESIGN TO PRODUCE SOLUTIONS THAT MEET SPECIFIED NEEDS	Does not follow the engineering design process, or the designed solution does not meet the specified need(s).	Reasonably follows the engineering design process to produce a solution that adequately meets the specified need(s).	Methodically follows the engineering design process to produce a solution that thoroughly meets the specified need(s).	
ABILITY TO DESIGN SOLUTIONS ACCOUNTING FOR BROADER CONSIDERATIONS, SUCH AS PUBLIC HEALTH, SAFETY, AND WELFARE, AS WELL AS GLOBAL, CULTURAL, SOCIAL, ENVIRONMENTAL, AND ECONOMIC FACTORS	The solution provided does not take into account broader practical considerations, such as public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	The solution provided takes into account and partially addresses some of the broader practical considerations, such as public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	The solution provided takes into account and thoroughly addresses several of the broader practical considerations, such as public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	

EAC RUBRIC: OUTCOME (3) – COMMUNICATION

Outcome (3) An ability to communicate effectively with a range of audiences

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
ABILITY FOR EFFECTIVE ORAL COMMUNICATION	The main ideas are not clearly presented. Low volume or monotonous tone make it hard for audience to engage. Speaker does not transmit any interest or enthusiasm about the topic.	The main ideas are clearly presented. Adequate volume and dynamic tone are used to engage audience. Speaker occasionally transmits interest and enthusiasm about the topic.	Speaker is an excellent communicator. The main ideas are clearly presented. Speaker is eloquent and dynamic, effective at engaging the audience. Speaker displays and transmits a strong interest and enthusiasm about the topic.	
ABILITY FOR EFFECTIVE WRITTEN COMMUNICATION	Content is disorganized, the main ideas are not clearly stated and developed. Writing style is rough or imprecise. Frequent grammar/spelling errors. Document presentation and format rough or inconsistent.	Content is well organized and the main ideas are clearly stated and reasonably developed. Writing style is adequate for purpose and readable. Grammar/spelling mostly correct. Document presentation and format adequate and consistent.	Content is very well organized and easy to follow, main ideas are clearly presented and thoroughly developed. Writing style is adequate for purpose, readable, and tailored to intended audience. Grammar/spelling correct. Work is professionally presented and very well formatted.	
ABILITY FOR EFFECTIVE GRAPHICAL COMMUNICATION	Inadequate use of figures, charts, and/or tables to display data. Figures are not well placed, many figures, charts, and tables missing key formatting elements, such as titles, labels, units, captions, etc. Overall, figures do not contribute to a better understanding of key ideas or results.	Adequate use of figures, charts, and tables to display data. Figures are well placed, most figures, charts, and tables are properly labeled and formatted. Figures moderately contribute to a better understanding of key ideas or results.	Excellent use of figures, charts, and tables to display data. All figures, charts, and tables properly labeled and formatted, easy to read and interpret. Figures substantially and effectively contribute to a better understanding of key ideas or results.	
ABILITY TO ADDRESS A RANGE OF AUDIENCES	Does not address target audience. Content is too technical or too superficial to be understood by and of interest to a wide range of audiences.	Adequately addresses the target audience. Content has a reasonable balance of technical and non-technical information to be understood by and of interest to a wide range of audiences.	Effectively addresses the target audience. Content has the right balance of technical and non-technical information to be understood by and of interest to a wide range of audiences.	

EAC RUBRIC: OUTCOME (4) – ETHICS

Outcome (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

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
ABILITY TO RECOGNIZE ETHICAL AND PROFESSIONAL RESPONSIBILITIES IN ENGINEERING SITUATIONS	Description of ethical and professional responsibilities is limited or rudimentary.	Description of ethical and professional responsibilities is substantive.	Description of ethical and professional responsibilities is complete and thorough.	
ABILITY TO IDENTIFY GLOBAL, ECONOMIC, ENVIRONMENTAL, AND SOCIETAL CONTEXTS IN ENGINEERING SITUATIONS	Identifies a single context area relevant in an engineering situation. Explanation of the context is rudimentary.	Identifies most context areas relevant in an engineering situation. Explanation of the contexts is substantive.	Identifies all context areas relevant in an engineering situation. Explanation of contexts is complete and thorough.	
ABILITY TO JUDGE THE IMPACT OF ENGINEERING SOLUTIONS ON GLOBAL, ECONOMIC, ENVIRONMENTAL, AND SOCIETAL CONTEXTS	Analysis and judgement of the impact of engineering solutions on contexts is rudimentary.	Analysis and judgement of the impact of engineering solutions on contexts is substantive.	Analysis and judgement of the impact of engineering solutions on contexts is complete and thorough.	

EAC RUBRIC: OUTCOME (5) – TEAMS

Outcome (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				
CRITERIA	1—DEVELOPING	2—ACCOMPLISHED	3—EXEMPLARY	SCORE
ABILITY TO PROVIDE TEAM LEADERSHIP	Lacks adequate ability to resolve problems and conflicts. Lacks ability to provide adequate leadership in decision making, planning, and goal setting. Does not show appreciation for other team members' contributions. Exhibits poor team communication skills (e.g., interrupts others, gets defensive, does not ask questions, gets distracted). Does not motivate others or lead by example.	Capable of resolving problems and conflicts. Demonstrates adequate leadership ability in decision making, planning, and goal setting. Occasionally shows appreciation for other team members' contributions. Exhibits reasonable team communication skills. Capable of motivating others. Willing to share problems and progress. Mainly does assigned work instead of willingly taking on additional responsibilities.	Proficient in resolving problems and conflicts and exhibits proficient leadership ability in decision making, planning, and goal setting. Appropriately recognizes and shows appreciation for other team members' contributions. Exhibits proficient team communication skills including good body language and active listening. Transparent about expectations and objectives. Motivates others and leads by example. Willing to share problems and take on additional responsibilities and help others when necessary.	
ABILITY TO CREATE A COLLABORATIVE AND INCLUSIVE ENVIRONMENT AS A TEAM MEMBER	Rarely uses respectful language or show cooperative communication skills. Does not demonstrate mutual respect and tends to dismiss others' unique perspectives, opinions, or ideas. Does not demonstrate ability and willingness to compromise with other group members.	Generally, uses respectful language and shows cooperative communication skills. Does not disrespect other group members or dismiss their unique perspectives, opinions, or ideas. Demonstrates adequate ability and willingness to compromise with other group members. Does not dismiss the sharing of ideas.	Uses respectful language and shows cooperative communication skills. Actively demonstrates mutual respect and welcomes others' unique perspectives. Demonstrates high ability and willingness to compromise with other group members. Makes other group members feel safe and valued through openly encouraging the sharing of ideas.	
ABILITY TO ESTABLISH GOALS, PLAN TASKS, AND MEET OBJECTIVES AS A TEAM MEMBER	Lacks basic awareness of team duties and responsibilities. Lacks basic awareness of the links between project goals and tasks. Fails to identify risks to meet project deadlines.	Capable of performing most team duties and responsibilities. Capable of establishing goals and performing necessary talks on time to meet project deadlines and identifies most issues impacting project success.	Proficient execution of all team duties and responsibilities. Proficient in establishing goals and performing necessary tasks on time to meet project deadlines and identifies issues impacting projects success.	

EAC RUBRIC: OUTCOME (6) – EXPERIMENTATION

Outcome (6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
ABILITY TO DEVELOP AND CONDUCT AN EXPERIMENT	Demonstrates inadequate knowledge and abilities for conducting experiments with standard test and measurement equipment to collect experimental data. May not observe lab safety and procedures.	Demonstrates adequate knowledge and abilities for conducting experiments. Able to use standard test and measurement equipment to collect experimental data. Reasonably capable of troubleshooting to overcome measurement problems. 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 and measuring devices and methodology for conducting experiments. Demonstrates a proficient ability to troubleshoot, predict and overcome measurement problems. Observes established lab safety plan and procedures. Proposes improvements as necessary.	
ABILITY TO ANALYZE AND INTERPRET DATA	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.	
ABILITY TO USE ENGINEERING JUDGEMENT TO DRAW CONCLUSIONS	Lacks the ability and awareness for interpreting experimental data to draw meaningful conclusions, decide, act, and/or communicate suggestive actions using of appropriate scientific/engineering principles, standards, and practices. Not adept at navigating complexity, open ended problems, or ambiguous data.	Adequately capable of interpreting experimental data to draw meaningful conclusions, decide, act, and/or communicate suggestive actions based upon the use of appropriate scientific/engineering principles, standards, and practices. May require significant guidance in the face of complexity, open ended problems, or ambiguous data.	Proficient in interpreting experimental data to draw meaningful conclusions, decide, act, and/or communicate suggestive actions based upon the use of appropriate scientific/engineering principles, standards, and practices. Able to make quality engineering decisions/conclusions, especially in the face of complexity, open-ended problems, or ambiguous data.	

EAC RUBRIC: OUTCOME (7) – LEARNING

Outcome (7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies

CRITERIA	1-DEVELOPING	2-ACCOMPLISHED	3-EXEMPLARY	SCORE
ABILITY TO ACQUIRE NEW KNOWLEDGE USING APPROPRIATE LEARNING STRATEGIES	Shows poor ability and little openness to acquire new knowledge and diagnosing their learning needs. Does not identify proper opportunities or resources to expand knowledge and skills. Unable or uninterested to find new information without significant guidance and prompting. Lacks awareness at one's current knowledge and skills for identifying basic gaps in understanding. Lacks the strategies and motivation necessary for self-directed learning.	Shows sufficient ability and openness to acquire new knowledge and diagnosing their learning needs. Able to identify some opportunities or resources to expand knowledge and skills. Able and interested to find new information, perhaps with some prompting. Uses current knowledge and skills to identify basic gaps in understanding. Exhibits adequate strategies and motivation necessary for self-directed learning.	Demonstrates proficient ability and openness to acquire new knowledge and diagnosing their learning needs. Independently identifies and uses a diverse range of resources to expand knowledge and skills. Able and interested to find new information with minimal prompting. Uses current knowledge and skills to identify key gaps in understanding. Exhibits exemplary strategies and motivation necessary for self-directed learning.	
ABILITY TO APPLY NEW KNOWLEDGE AS NEEDED	Inadequately unmotivated and skilled at applying new knowledge as needed for decision making, completing tasks, drawing conclusions, and/or understanding a topic in more depth. Insufficiently understands and determines the significance or relevance of the learned information needed for the task.	Adequately motivated and skilled at applying new knowledge as needed for decision making, completing tasks, drawing conclusions, and/or understanding a topic in more depth. Partially understands and determines the significance or relevance of the learned information needed for the task.	Proficiently skilled and motivated at applying new knowledge as needed for decision making, completing tasks, drawing conclusions, and/or understanding a topic in more depth. Understands and determines the significance or relevance of the learned information needed for the task.	

7 Raw Assessment Data

The EERE department stores all data used for direct assessment in the *EERE/Assessment* folder in Teams. The raw data for the BSEE direct assessments performed in AY2020-21 can be found in the folder *EERE/Assessment/BSEE/2020-21.* The documentation in the folder includes, for every direct assessment performed, a copy of the assignment used for assessment of the outcome, the individual student work, and a spreadsheet listing the scores given to each student in the different performance criteria for the outcome, according to the outcome rubric. This data is not included in the report for space considerations, but access to this data is available upon request.