– Electronics Engineering Technology –
2018-19 Assessment Report

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Contents

1 Introduction

1.1 Program Location

The Bachelor of Science in Electronics Engineering Technology (BSEET) is offered at the Oregon Tech Wilsonville Campus on the south side of the Portland metropolitan area. The campus is situated in a wooded business park setting among several technology companies including Mentor Graphics, Rockwell Collins, and Xerox. The campus is conveniently located off Interstate 5 and a short walk away from the Wilsonville Station on the Westside Express Service (WES) commuter rail line that connects to Beaverton and the MAX Light Rail. The campus is only about a 30 minute drive from high-tech companies in the Hillsboro and Beaverton area such as Intel, Tektronix, MAXIM, Credence, Lattice, Synopsis, TriQuint, and ESI. Some of the core courses and technical electives are also available online.

1.2 Program Goals and Design

The program is designed to prepare graduates to assume engineering and technology positions in the electronics industry. Graduates of the Electronics Engineering Technology program fulfill a wide range of functions within industry. Bachelor's degree graduates are currently placed in positions such as component and system design, test engineering, product engineering, field engineering, manufacturing engineering, sales or market engineering, and quality control engineering. The program also provides a solid preparation for students intending to continue to graduate school to pursue master's degrees in engineering, engineering management, and M.B.A.s. Employers of Electronics Engineering Technology graduates include research and development laboratories, electronic equipment manufacturers, public utilities, colleges and universities, government agencies, medical laboratories and hospitals, electronic equipment distributors, semiconductor companies, and automated electronic controlled processing companies. Recent graduates have been employed at companies such as MAXIM, Qorvo, Tektronix, Biotronik, and Intel.

The BSEET degree at Oregon Tech Wilsonville is especially suited for working professionals with an associate's degree in Electronics Engineering Technology, Microelectronics Technology, or equivalent coursework. Students entering the B.S. degree in Electronics Engineering Technology program by transfer are requested to contact the EET Program Director concerning transfer of technical coursework. 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. Our BSEET program has articulation agreements with the Electronics and Microelectronics programs at Portland Community College, Clackamas Community College, Chemeketa Community College, and Columbia Gorge Community College. 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.

1.3 Program Brief History

The BSEET program at Oregon Tech was first accredited by ABET in 1970. The last ABET accreditation visit took place in Fall 2014.

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 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 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.

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

Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. The Program Educational Objectives of Oregon Tech's Bachelor of Science in Electronics Engineering Technology are:

- 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.
- 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.
- 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

These program objectives support Oregon Tech's institutional mission statement, which states:

> 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.

2.4 Program Outcomes

The BSEET Program Outcomes include ABET's ETAC $a-k$ outcomes as well as the electronics specific $l-n$ outcomes.

These are listed below:

a an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.

b an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.

c an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.

d an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

e an ability to function effectively as a member or leader on a technical team.

f an ability to identify, analyze, and solve broadly-defined engineering technology problems.

g an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature.

h an understanding of the need for and an ability to engage in self-directed continuing professional development.

i an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity.

j a knowledge of the impact of engineering technology solutions in a societal and global context.

k a commitment to quality, timeliness, and continuous improvement.

l the ability to analyze, design, and implement control systems, instrumentation systems, communications systems, computer systems, or power systems.

m the ability to apply project management techniques to electrical/electronic(s) systems.

n the ability to utilize statistics/probability, transform methods, discrete mathematics, or applied differential equations in support of electrical/electronic(s) systems.

2.5 New Program Outcomes for AY2019-2020 and Later

On November 2, 2018 the ABET Board of Delegates - Engineering Technology Area Delegation approved a major revision of outcomes effective for reviews during the 2019-2020 accreditation cycle. The new outcomes were communicated through an Accreditation Alert and are published in the 2019-2020 Criteria for Accrediting Engineering Technology Programs. To comply with these changes next year (AY2019-2020) the BSEET program will replace ABET $a-n$ outcomes with the new ABET (1)-(5) outcomes:

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;

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

3) 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) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and

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

Changes to the ABET outcomes will be sufficiently communicated among different stakeholders (faculty, IAB, students). A mapping between the old ABET ETAC $a-k$ outcomes and the new $(1)-(5)$ outcomes are presented in the table below. This mapping is partly based on the document ETAC: Side-by-side comparison posted in an Accreditation Alert from ABET.

Table 1: Mapping between old ABET ETAC $a-k$ outcomes and the new $(1)-(5)$ outcomes.

Outcome	(1)	(2)	(3)	(4)	(5)	Notes
a. Fundamentals	√	–	–	–	–	–
b. Application	√	–	–	–	–	And under Criterion 5
c. Experimentation	–	–	–	√	–	–
d. Design	–	√	–	–	–	–
e. Teamwork	–	–	–	√	–	
f. Problem Solving	√	–	–	–	–	–
g. Communication	–	–	√	–	–	–
h. Lifelong Learning	–	–	–	–	–	Omitted
i. Ethics	–	√	–	–	–	And under Criterion 5
j. Impact	–	√	–	–	–	And under Criterion 5
k. Continuous Improvement	–	–	–	–	–	Moved to Criterion 5
l. Electronic Systems	–	–	–	–	–	Program criteria (curriculum)
m. Project Management	–	–	–	–	–	Program criteria (curriculum)
n. Advanced Mathematics	√	–	–	–	–	–

3 Cycle of Assessment for Program Outcomes

3.1 Introduction and Methodology

Assessment of the program outcomes is conducted over a three year-cycle. Table 2 shows the minimum outcomes assessed each year. This assessment is performed using specific assignments, exam questions, and projects that target the particular outcome. A systematic, rubric-based process is then used to assess student attainment of the outcome based on a set of performance criteria. The results of all the assessment activities are then summarized

in an annual assessment report. At the end of each academic year, the program faculty meet to review the assessment data at the annual Closing-The-Loop meeting.

Additionally, all graduating students are asked to fill out an anonymous exit survey. As part of the survey, students are asked to rate their level of attainment of the program outcomes. This provides an indirect assessment measure. The results of this indirect assessment are also included in the assessment report, and evaluated at the Closing-The-Loop meeting.

The Closing-The-Loop meetings provide an opportunity to evaluate and compare assessment results, and discuss whether any changes are needed to the curriculum or to the assessment methodology in order to improve attainment of the outcomes or to improve effectiveness, objectivity, and consistency in the assessment methodology. By comparing assessment results over multiple years, faculty can also ascertain the effect of previous changes to curriculum or assessment methodology on outcome attainment or assessment results.

3.2 Assessment Cycle

The assessment cycle which ends this year is shown in Table 2. Next year, a new assessment cycle will be begin as discussed in the next section.

Table 2: BSEET Outcome Assessment Cycle. Check marks ($\surd$) indicate standard assessment cycle, daggers (†) indicate additional assessments performed, check marks with asterisks ($\surd^*$) indicate assessments that were not performed due to lack of BSEET enrollment in assigned courses.

Outcome	2014/15	2015/16	2016/17	2017/18	2018/19
a. Fundamentals	–	–	$\surd$	–	–
b. Application	$\surd$	–	–	$\surd$	–
c. Experimentation	–	$\surd$	–	–	$\surd$
d. Design	$\surd$	–	–	$\surd^*$	†
e. Teamwork	$\surd$	–	–	$\surd$	–
f. Problem Solving	–	–	$\surd$	–	–
g. Communication	–	–	$\surd$	†	–
h. Lifelong Learning	–	–	$\surd$	–	–
i. Ethics	–	$\surd$	†	–	–
j. Impact	–	$\surd$	–	†	$\surd$
k. Continuous Improvement	$\surd$	–	–	$\surd^*$	†
l. Electronic Systems	–	$\surd$	†	–	$\surd$
m. Project Management	–	–	$\surd$	–	–
n. Advanced Mathematics	$\surd$	–	†	$\surd$	–

3.3 Assessment Plan for AY2019-2020 and Later

Next year (AY2019-2020) the BSEET program will replace ABET $a-n$ outcomes with the new ABET (1)-(5) outcomes. During the Closing-The-Loop meeting in October 2019,

the faculty developed a new assessment plan as shown in Table 3. The courses for which each outcome will be assessed are indicated. Under this plan, we will assess all new ABET (1)-(5) outcomes in 2019/20, and develop a more detailed assessment schedule at the next Closing-The-Loop meeting in 2020.

Table 3: New BSEET Outcome Assessment Plan for 2019/2020

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	EE 335	Team project

3.4 Summary of Assessment Activities for AY2019-2020

The sections below describe the assessment activity and performance of students for each of the assessed program outcomes. The tables report the number of students performing at a 1-developing, 2-accomplished, and 3-exemplary level for each performance criteria, as well as the percentage of students performing at an accomplished level or above. The departmentally established objective is to have at least 80% of students performing at an accomplished level or better. If a smaller percentage of students is meeting this threshold in any of the performance criteria, this would be flagged as an area of concern and further action would be discussed at the Closing-The-Loop meeting.

3.4.1 Targeted Assessment for Outcome c: an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.

This outcome was assessed in ENGR 465 - Capstone Project in Spring 2019

Outcome (c) : ENGR 465, Spring 2019, Dr. Aaron Scher

This outcome was assessed in the ENGR 465 - Capstone Project, in Spring 2017. 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.

Four BSEET students were assessed in Spring 2019 using the performance criteria listed in the table below. The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria.

Table 4 summarizes the results of this targeted assessment. The results indicate that the minimum acceptable performance level of 80% was met on all performance criteria for this program outcome, that is, over 80% of students were able to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes.

Table 4: Targeted Assessment for Outcome c: 1) Criterion 1 - an ability to conduct experiments, 2) Criterion 2- an ability to analyze and interpret experimental results, and 3) Criterion 3 - an ability to apply experimental results to improve processes.

Outcome (c) : ENGR 465, Spring 2019, Dr. Aaron Scher

Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	% Students ≥ 2
1 - Conduct experiments	0	1	3	100%
2 - Analyze/Interpret	0	1	3	100%
2 - Apply	0	1	3	100%

3.4.2 Targeted Assessment for Outcome d: an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

This outcome was assessed in is EE325 - Electronics III in Spring 2019

Outcome (d) : EE 325, Spring 2019, Dr. Cristina Crespo

This outcome was assessed in the final project for the course, which involved the design of an electronic system. Students were asked to research a variety of applications in electronics, and select a particular project in an area of interest. Students were asked to generate a project proposal, including some background establishing the need/relevance of the project, a project definition (specification), and all the necessary information to implement the project (resources needed, list of components, useful references, etc.). Then, students were required to produce an original design for their electronic system, using tools such as LTSpice to model/simulate their circuit, generate a PCB layout, implement, and troubleshoot their circuit on an actual PCB board. Students were also asked to present their design by generating a scientific poster and recording a short video explaining their circuit and providing a live working demo.

Three BSEET students were assessed in Spring 2019 in the course EE325 Electronics III using the performance criteria listed in the table below. Three BSEET students were assessed, and they all met most of the performance criteria, demonstrating an overall satisfactory ability to define, design, implement, and troubleshoot an electronic system. The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria. One of the students did not attempt to establish the need or relevance of the project, bringing the level of attainment of this outcome below the 80

Table 5: Targeted Assessment for Outcome d: 1) Criterion 1- an ability to establish the need and relevance of the project, 2) Criterion 2 - an ability to define the project, 3) Criterion 3 - an ability to gather necessary information, 4) Criterion 4 - an ability to apply creativity in the design of systems, components, or processes, 5) Criterion 5 - an ability to apply modeling techniques and tools to evaluate the design, 6) Criterion 6 - an ability to implement the design, 7) Criterion 7 - an ability to test and troubleshoot the final design, 8) Criterion 8 - an ability to present their design both in oral and written form.

Outcome (d) : EE 325 Spring 2014, Dr. Cristina Crespo

Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	% Students ≥ 2
1 - Relevance	1	2	0	66.67%
2 - Definition	0	3	0	100%
3 - Information	0	3	0	100%
4 - Design	0	3	0	100%
5 - Modeling	0	1	2	100%
6 - Implementation	0	1	2	100%
7 - Testing	0	1	2	100%
8 - Presentation	1	0	2	66.7%

3.4.3 Targeted Assessment for Outcome j: a knowledge of the impact of engineering technology solutions in a societal and global context

This outcome was assessed in EE 401 - Communication Systems in Spring 2019.

Outcome (j) : EE 401, Spring 2019, Aaron Scher

This outcome was assessed in EE 401 - Communication Systems in Spring 2019. Students were asked to research the impacts of 5G on society and write a paper. Students were asked to provide an overview of 5G technology, identify risks and benefits of 5G to society, and describe feasible technological solutions to mitigate the risks. For each solutions, students were asked to describe the ethical and professional responsibilities involved and potential long-term impacts to society.

One BSEET students was assessed in Spring 2019 in the course EE 401 - Communication Systems using the performance criteria listed in the table below. The minimum acceptable performance level was to have above 80 % percent of the students performing at the accomplished or exemplary level in all performance criteria. The results indicate that the minimum acceptable performance level of 80 % was met on all performance criteria.

Table 6: Targeted Assessment for Outcome j: 1) Criterion 1- Demonstrate knowledge of the impact of engineering technology solutions in a society context. 2) Criterion 2- Demonstrate knowledge of the impact of engineering technology solutions in a global context.

Outcome (j) : EE 401, Spring 2019, Aaron Scher

Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	% Students ≥ 2
1 - Society	0	1	0	100%
2 - Global	1	0	0	0%

3.4.4 Targeted Assessment for Outcome k: a commitment to quality, timeliness, and continuous improvement.

This outcome was assessed in is EE 325 - Electronics III in Spring 2019.

Outcome (k) : EE 325, Spring 2019, Dr. Cristina Crespo

This outcome was assessed in the final project for the course, which involved the design of an electronic system. Students were asked to research a variety of applications in electronics, and select a particular project in an area of interest. Students were asked to generate a project proposal, including some background establishing the need/relevance of the project, a project definition (specification), and all the necessary information to implement the project (resources needed, list of components, useful references, etc.). They proposal also needed to include a timeline for the project, as well as projected cost. Students were required to design and implement their project on a PCB board, and deliver a poster and oral presentation with live demo of their design. The overall quality of the design and presentation, the adherence to the timeline, and the ability of students to make incremental improvements using instructor feedback and an iterative design process were used to assess the students' commitment to quality, timeliness, and continuous improvement.

Table 7 summarizes the results of this targeted assessment. The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria. Three BSEET students were assessed. Two of them showed an outstanding level of attainment in this outcome. Despite meeting the project timeline, the other student did not show a satisfactory level of quality or continuous improvement in this project.

Table 7: Targeted Assessment for Outcome k: 1) Criterion 1 - commitment to quality, 2) Criterion 2 - timeliness, and 3) - continuous improvement.

Outcome (k) : EE 325, Spring 2019, Dr. Cristina Crespo

Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	% Students ≥ 2
1 - Quality	1	0	2	66.67%
2 - Timeliness	0	1	2	100%
3 - Cont. Improvement	1	0	2	66.67%

3.4.5 Targeted Assessment for Outcome l: the ability to analyze, design, and implement control systems, instrumentation systems, communications systems, computer systems, or power systems.

This outcome was assessed in EE 325 - Electronics III in Spring 2019

Outcome (l) : EE 325, Spring 2019, Dr. Cristina Crespo

This outcome was assessed in the final project for the course, which involved the design of an electronic system. Students were asked to research a variety of applications in electronics, and select a particular project in an area of interest, which could involve a control system, instrumentation system, communications system, computer system, or power system. Students were asked to generate a project proposal, including some background establishing the need/relevance of the project, a project definition (specification), and all the necessary information to implement the project (resources needed, list of components, useful references, etc.). Then, students were required to produce an original design for their electronic system. Students were required to: (1) analyze the system using appropriate mathematical tools and models, (2) model/simulate their systems using CAD tools such as LTSpice, generate a PCB layout, (3) implement and troubleshoot a prototype of their system on an actual PCB board. Students were also asked to present their design by generating a scientific poster and recording a short video explaining the operation of their circuit and providing a live working demo

Table 8 summarizes the results of this targeted assessment. The minimum acceptable performance level was to have above 80% of the students performing at the accomplished or exemplary level in all performance criteria. Three BSEET students were assessed, and they all met the performance criteria, demonstrating an overall satisfactory ability to analyze, design, and implement a control system, instrumentation system, communication system, computer system, or power system.

Table 8: Targeted Assessment for Outcome l: 1) Criterion 1 - an ability to analyze electronic systems, 2) Criterion 2 - an ability to design electronic systems, and 3) - an ability to implement electronic systems.

Outcome (l) : EE 325, Spring 2019, Dr. Cristina Crespo

Performance Criteria	1-Developing	2-Accomplished	3-Exemplary	% Students ≥ 2
1 - Analyze	0	1	2	100%
2 - Design	0	1	2	100%
3 - Implement	0	1	2	100%

3.4.6 2018-2019 Indirect Assessment

In addition to direct assessment measures, the student outcomes a – n were indirectly assessed through a senior exit survey.

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

4 Evaluation and Continuous Improvement

The BSEET faculty met in October 2019 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. Table 9 provides a summary of the 2018-19 assessment results for the outcomes which were directly assessed. This data is separated into outcomes and courses assessed. Figure 1 presents a summary of all assessment results from AY 2012-13 to present.

This year marks the end of both the current assessment cycle and the use of the old $a - k$ ABET outcomes. This provides the faculty a chance to reflect and assess data and trends with regards to continuous improvement. Figure 1 shows that we have assessed each outcome at least twice over the assessment cycle. Over half the outcomes were assessed at least three times over the cycle.

Figure 1 also reveals a trend towards lower enrollment in the BSEET program in recent years, which is reflected in the low sample sizes. A major cause of this lower enrollment is the attractiveness of our BSEE program, as we have found that many students are choosing to pursue the BSEE over the BSEET degree. However, this past year the enrollment in our BSEET program increased due to a renewed effort towards recruitment and advertising the BSEET program's attractive features like hands-on instruction, transferability and graduate success.

The last column in Figure 1 averages the performance over the entire cycle for all students assessed. Because of the low sample sizes for individual years, we find it useful to combine together the data to generate a larger sample size. The larger sample size provides a more accurate view and better allows for general inferences and conclusions.

The objective set by the BSEET faculty was to have at least 80% of the students perform at the level of accomplished or exemplary in all performance criteria of the assessed outcomes. The last column in Figure 1 shows that we achieved our goal for all outcomes except for outcomes (f), (j), and (m). The performance of these three outcomes was still greater than 70%, which is very close to the threshold. Overall, our data obtained through direct assessment shows clear evidence of the attainment of student outcomes. These results were evaluated and it was concluded that no major programatic changes are necessary. The faculty have been informed of the results with a note that class projects should focus more on engineering impact, problem solving, and project management.

As discussed previously, next year we will be starting a new cycle with the new ABET $(1) - (5)$ outcomes. The faculty agreed that to improve our assessment methodology going forward we will create a table with all recommendations from the Closing the Loop meeting. This table will be updated yearly and documented in the assessment report. Keeping all the recommendations in one convenient table will better serve the faculty in assessing the impact of instructional and curriculum changes.

Table 9: Summary of BSEET direct assessment for AY2018-19.

	1-Developing	2-Accomplished	3-Exemplary	% Students ≥ 2
c - Test and measurement - ENGR 465 (Scher)				
1 - Conduct experiments	0	1	3	100%
2 - Analyze/Interpret	0	1	3	100%
2 - Apply	0	1	3	100%
d - Design - EE 325 (Crespo)				
1 - Relevance	1	2	0	66.67%
2 - Definition	0	3	0	100%
3 - Information	0	3	0	100%
4 - Design	0	3	0	100%
5 - Modeling	0	1	2	100%
6 - Implementation	0	1	2	100%
7 - Testing	0	1	2	100%
8 - Presentation	1	0	2	66.7%
j - Impact - EE 401 (Scher)				
1 - Society	0	1	0	100%
2 - Global	1	0	0	0%
k - Continuous improvement - EE 325 (Crespo)				
1 - Quality	1	0	2	66.67%
2 - Timeliness	0	1	2	100%
3 - Cont. Improvement	1	0	2	66.67%
l - Electronic systems - EE 325 (Crespo)				
1 - Analyze	0	1	2	100%
2 - Design	0	1	2	100%
3 - Implement	0	1	2	100%

Outcome	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	Entire cycle 2012 - 2019
a Fundamentals	21				14			35
b Application			17			3		20
c Experimentation		18		12			4	34
d Design			18				3	21
e Teamwork	14		18			3		35
f Problem solving		11			8			19
g Communicaiton		18			8	3		29
h Lifelong Learning		15			10			25
i. Ethics	18			4	5			27
j. Impact	14			4		1	1	20
k. Cont. Improvement		14	19				3	36
l Electronic Systems	18			5	4		3	30
m Project mgmt		18			8			26
n Advanced math			7		5	3		15

Numbers indicated are sample size (N)

Legend:

- Performance>80%
- 70%<Performance<80%
- Performance<70%
- Sample size N <10

Figure 1: Summary of assessment results from AY 2012-13 to present.