Bachelor of Science in Mechanical Engineering Technology (BSMET)

2021 - 2022 Program Assessment Report

Fall 2022

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The BSMET program director will supplement this report with any data that can be found later.

The BSMET program director will follow the template herein to write the next year's report.

Contents

1 Introduction

1.1 Background

Oregon Tech's Bachelor of Science in Mechanical Engineering Technology (BSMET) is an applied engineering technology program. Mechanical engineering technology student at Oregon Tech, will have an educational experience that emphasizes hands-on learning. With a significant number of classes taught in labs using state-of-the-art equipment, upon graduation students will be ready to contribute to innovation and efficiency in a variety of industrial, commercial, and consulting organizations. This program prepares students for a rewarding and exciting career path by providing them with practical knowledge and a well-rounded, career-relevant education. The Mechanical Engineering Technology degree curriculum is designed around a foundational core of applied coursework including:

- Solid and fluid mechanics
- Applied thermodynamics
- Manufacturing processes
- Geometric Dimension/Tolerance
- Heat Transfer
- Machine Design
- Industrial controls
- Computer-aided design and manufacturing
- Engineering materials
- Electric power systems

Mechanical engineering technologists are needed throughout the design process of mechanical products to create blueprints, processes for assembly, to streamline production, provide quality assurance, and to inspect and test completed products. Without the work of mechanical engineering technologists, the products designed by engineers could not be produced with the efficiency and accuracy technologists provide.

As a mechanical engineering technologist, students can be hired in a variety of industries and can specialize in a variety of areas, including energy systems, applied mechanics, automotive design, manufacturing, materials, plant engineering and maintenance, pressure vessels and piping, heating, refrigeration, and air-conditioning systems. The graduates of Mechanical Engineering Technology program work for companies such as:

- Boeing
- Nike
- Intel
- Rockwell Collins
- Specialized Bicycle Components
- SolarCity

The length of time required to complete program requirements depends upon the number of classes transferred into program requirements, the number of classes taken per term, and the

number of terms the student completes in a year. The student's work schedule, overtime schedule, family life, and outside commitments are a consideration in determining how long it will take a student to complete the program.

1.2 Program History

The Bachelor of Science in Mechanical Engineering Technology (BSMET) Program at Oregon Institute of Technology (OIT) was first accredited by ABET in 1970. Based on recommendations from the MMET Industry Advisory Council, curricular changes have been made to keep the program current: more 3D parametric modeling programs are available, computational fluid dynamics is using some state of the art software, sketching and some basic CAD tools have been included in the orientation class, project management was added, and elective courses have been added to provide exposure to new technologies related to lean manufacturing, composites and alternative forms of energy such as wave energy. There was an ABET-ETAC review (both a self-study and on-site visit at all 3 campuses) of the BSMET and BSMFG programs that resulted in a full reaccreditation until 2021 when the next visit is scheduled. Both programs reside in the MMET Department under one department chair, and both are available at all three locations catering to the needs of a diverse schedules, student profiles and industry needs.

There have been several program changes since then. Most of the changes involve the replacement of Engineering Technology courses with similar Engineering courses. Also, several curricular changes have occurred in the past six years based on assessment findings, Industrial Advisory Council input, and faculty insights. These changes are shown below:

- ENGT 415 Occupational was changed to ENGR 415 Occupational Safety
- ENGR 485 Fund of Engineering Exam was dropped from the curriculum
- MFG 461 Senior Project I was changed to ENGR 491 MMET Senior Projects I
- MFG 462 Senior Project II was changed to ENGR 492 MMET Senior Projects II
- MFG 463 Senior Project III was changed to ENGR 493 MMET Senior Projects III
- MET 160 Material I was changed to MECH 260 Engineering Material I
- MET 360 Materials II was changed to MECH 360 Engineering Materials II
- MET 326 Electrical Power Systems was changed to ENGR 326 Electrical Power Systems
- Choice of PHY 201/221 and 202/222 was changed to PHY 221 and PHY 222 General Physics with Calculus
- CHE 101/104 was changed to CHE 201/204 General Chemistry
- MET 111 and MET 112 Orientations I and II were replaced with ENGR 111 MMET Orientation
- MET 315 and MET 316 Machine Design I and II were changed to MECH 315 and MECH 316 Machine Design I and II
- MECH 363 Engineering Instrumentation was added to the curriculum
- MECH 426 Fluid Power Systems was added to the curriculum
- Several Business/management electives were removed from the curriculum.

1.3 Program Locations

The BSMET program is located at Oregon Tech campuses (Klamath Falls, Wilsonville and Seattle), serving a large portion of rural Oregon, Washington and California, as well as the Portland and Seattle metropolitan area. The four MMET programs, MFG, Mechanical Engineering Technology (MET), Mechanical Engineering (ME), and the Master of Science in Manufacturing Engineering Technology (MS MFG) reside in three locations. The main or home campus is in Klamath Falls, Oregon. 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. The second campus, primarily catering to the working professional, is in Wilsonville, Oregon and is commonly referred to as the Urban campus. The third location is in Seattle, Washington, established at the Boeing facility for their employees. The breakdown of programs and degrees offered at these three sites are as follows:

Klamath Falls Campus

- Manufacturing Engineering Technology (MFG)
- **Mechanical Engineering Technology (MET)**
- Mechanical Engineering (ME)

Wilsonville Urban Campus

- Manufacturing Engineering Technology (MFG)
- **Mechanical Engineering Technology (MET)**
- Mechanical Engineering (ME)

Seattle Campus

- Manufacturing Engineering Technology (MFG)
- **Mechanical Engineering Technology (MET)**
- Mechanical Engineering (ME)
- Masters in Manufacturing Engineering Technology (MS MFG)

Note that the MFG Masters program is currently being offered on Seattle Campus only.

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 BSMET 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 BSMET 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 considering 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.

In summary the constituents of the Manufacturing Engineering Technology Program include:

- Faculty
- Community Colleges
- Alumni
- Industry Advisory Committee
- Industry/Employers

The constituencies for the BSMET program in Wilsonville and Seattle are the same as those for the Klamath Falls campus/program. The Seattle program is offered exclusively for employees of the Boeing Company. Boeing and its employees are the primary stakeholders. The quality of the programs in Wilsonville and Seattle is critical to the overall BSMET program quality so all those listed above are influential and direct/guide the program.

1.5 Program Enrollment and Graduation Data

Table 1 presents the BSMET program enrollment from Fall 2018 to Fall 2022. Table 2 presents the number of BSMET degrees awarded over the same time span.

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

	Fall 2018	**Fall 2019**	**Fall 2020**	**Fall 2021**	**Fall 2022**
Klamath Falls	25	35	32	31	24
Portland Metro	40	23	20	23	17
Seattle-Boeing	3	2	1	0	0

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

	2017-18	**2018-19**	**2019-20**	**2020-21**	**2021-22**
Klamath Falls	9	4	3	2	8
Portland Metro	10	10	5	2	5
Seattle-Boeing	2	0	0	1	0

2 Program Mission, PEOs and SOs

2.1 Program Mission

The Mechanical Engineering Technology Program at Oregon Institute of Technology is an applied engineering technology program. Its mission is to provide graduates with the skills and knowledge for successful careers in mechanical engineering and manufacturing engineering.

2.2 Program Educational Objectives (PEOs)

1. 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 Manufacturing Engineering Technology Program are to produce graduates who:
   - (**Knowledge**) are able to analyze, design, implement, and maintain practical mechanical and manufacturing systems.
   - (**Communication**) communicate effectively and work well on team-based engineering projects.
   - (**Profession**) succeed in manufacturing and mechanical engineering technology positions.
   - (**Life-long Learning**) pursue continued professional development.

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 of the BSMET Program is in line with and built upon the mission statement of the Institution. This is evident by comparing the Program Mission Statement with the Institution's Mission Statement given previously. The intent of the BSMET Program in providing an applied manufacturing engineering education is directly in line with the Institution mission statement

PEO1 requires graduates should have a strong technical background in mechanical and

manufacturing systems, as well as analytical and practical problem-solving skills that enable them to succeed as professionals. The BSMET curriculum complies with the university's mission in offering "innovative, professionally-focused degree programs" with an emphasis on "hands-on education".

PEO2 focuses on educating graduates to be effective collaborators and communicators in a diverse setting while they pursue technical and managerial roles in their professions. This is consistent with the university's mission to be committed to leadership and diversity development.

PEO3 specifies the types of professions and positions that graduates should be ready to fulfill. It is consistent with the needs of the mechanical and manufacturing industry in the state of Oregon, nationwide and internationally.

PEO4 has a focus on lifelong learning that graduates will stay current in the fast developing and newly emerging fields in the manufacturing industry. The PEO is in alignment with the university's mission to meet "the current and emerging needs of Oregonians".

2.4 Program Student Outcomes

The Mechanical Engineering Technology program student learning outcomes have been mapped to the five ABET outcomes listed below. A baccalaureate degree program in engineering technology must demonstrate that graduates have:

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 nontechnical environments; and an ability to identify and use appropriate technical literature;
4. (**Experiment**) an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes; and
5. (**Teamwork**) an ability to function effectively as a member as well as a leader on technical teams.

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 careers. The student outcomes (SOs) are the criteria that measure the performances of the BSMET students in mastering the essential knowledge and skills required by their future careers. Achieving these student outcomes will ensure the successful

achievements of the educational objectives.

Table 3 shows a map of the BSMET SO's to the program educational objectives. As the table indicates, the student learning outcomes correlate tightly with the educational objectives.

Table 3: Mapping between BSMET SO's PEO's

Student Outcome	PEO1 Knowledge	PEO2 Communication	PEO3 Profession	PEO4 Life-long Learning
SO 1-Problem Solving	**x**		**x**	**x**
SO 2 -Design	**x**		**x**	**x**
SO 3 -Communication		**x**		
SO 4 -Experiment	**x**		**x**	
SO 5 -Teamwork	**x**	**x**		

2.6 Process for Establishment and Revision of PEO's and SO's

The BSMET Program at Oregon Tech follows a three year assessment cycle. Within the assessment plan are provisions for review and revision of the Program Educational Objectives (PEO's). In brief, the first year of the assessment cycle the PEOs are reviewed by the faculty and by the program's **Industrial** Advisory Board (IAB) to make sure that they are in line with the mission of the institution, ABET requirements, and of the mechanical engineering constituents. If they are found to need revision the faculty drafts those revisions. They are then reviewed by the IAB with modifications being made as appropriate. Once the faculty and IAB are satisfied with the new draft PEO's they go out to a larger cross section of our constituencies for review and possibly further revision.

The PEO's and SO's are periodically reviewed to ensure they stay relevant. The revision process involves different constituents. With the recent reduction in student outcomes from a-k to 1-5, a draft two-year assessment cycle plan has been written. Also, each fall term the MMET Department holds a day-long retreat to discuss the program curriculum and PEO's. If any changes are proposed, they are reviewed in relation to how they affect the PEO's. Proposed changes are also reviewed with IAB; which normally meets with the faculty twice a year (fall and spring terms). The table below demonstrates the revision process:

Table 4: BSMET PEO and SO Review Process

Event	Task
Convocation	MMET faculty review PEO's and SO's in light of assessment data and feedback collected from last academic year. Faculty may propose and approve changes to PEO's or SO's
IAB meetings	If changes to PEO's or SO's have been proposed and approved by MMET faculty, they are presented to IAB for consideration and approval or revision.
Close-the-Loop meetings	If PEO or SO changes have been approved by the faculty and IAB, they are announced and included in the Assessment Report. New PEO's or SO's are submitted for update on the website and catalog for the following academic year. In the assessment report, weaknesses identified from the last year's assessment will set up an action plan and assessment schedule to be assessed in the upcoming year. The assessment schedule will be updated accordingly.

2.7 Institutional Assessment and ISLOs

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 applicable to all majors. A description of the ISLOs can be found at https://www.oit.edu/academic-excellence/GEAC/essential-studies/Institutional-student-learning-outcome

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 are built. Engaging in these ISLOs will support Oregon Tech graduates in developing the awareness and behaviors of professionals and lifelong learners.

Institutional Student Learning Outcomes: Oregon Tech students will

- (ISLO1) **communicate** effectively orally and in writing.
- (ISLO2) engage in a process of **inquiry and analysis**.
- (ISLO3) make and defend reasonable **ethical judgements**.

- (ISLO4) collaborate effectively in **teams or groups**.
- (ISLO5) demonstrate **quantitative literacy**.
- (ISLO6) explore **diverse perspectives**.

An initial comparison of the ISLO's to the BSMET SO's reveals tight alignment between the two sets of outcomes. Both sets of outcomes support and complement each other. This also facilitates the coordination of assessment and continuous improvement efforts at the program and institutional level. Table 5 shows the mapping of the BSMET SO's to the ISLO's.

Table 5: Mapping between BSMET and ISLO's

Oregon Tech ISLO	BSMET SO
ISLO 1 Communication Oregon Tech students will communicate effectively orally and in writing.	3. an ability to apply written, oral, and graphical communication in broadly-defined technical and nontechnical environments; and an ability to identify and use appropriate technical literature;
ISLO 2 Inquiry & Analysis Oregon Tech students will engage in a process of inquiry and analysis.	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; 4. an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes;
ISLO 3 Ethical Reasoning Oregon Tech students will make and defend reasonable ethical judgments.	2. an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline;
ISLO 4 Teamwork Oregon Tech students will collaborate effectively in teams or	5. an ability to function effectively as a member as well as a leader on technical teams.

groups.	
ISLO 5 Quantitative Literacy Oregon Tech students will demonstrate quantitative literacy.	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;
ISLO 6 Diverse Perspectives Oregon Tech students will explore diverse perspectives.	2. an ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline; 5. an ability to function effectively as a member as well as a leader on technical teams.

2.8 Mapping of BSMET Curriculum to SO's and ISLO's

Table 6 shows the mapping of the BSMET curriculum to the SO's, as well as the institutional ISLO's. 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 students. They have been marked with X. The mapping primarily pairs the courses with ISLO's below:

Table 6: Mapping between BSMET courses and ISLO's

ISLOs **courses**	**ISLO1** **communicate**	**ISLO2** **Inquiry & Analyze**	**ISLO3** **Ethical**	**ISLO4** **Team**	**ISLO5** **Qualitative Literacy**	**ISLO6** **Diversecity**
ENGR 111	F	F	F	F		F
MATH 111		F			F	

ISLOs courses	ISLO1 communicate	ISLO2 Inquiry & Analyze	ISLO3 Ethical	ISLO4 Team	ISLO5 Qualitative Literacy	ISLO6 Diversecity
WRI 121	F	F	F		F	
Hum	F		F			F
CHE101/104		F		F	F	
CHE 201		F		F	F	
CHE 204		P		P		
MATH 112		P	P		P	
MET 241		P			P	
MFG 120	P	P		P	P	
MATH 251		P	P		P	
MET 242		P			P	
MFG 103	P			P		
SPE 111	F			F		
HUM	F		P			
MATH 252	P					
MECH 260		F				
MFG 314	P	P		P	P	

ISLOs courses	ISLO1 communicate	ISLO2 Inquiry & Analyze	ISLO3 Ethical	ISLO4 Team	ISLO5 Qualitative Literacy	ISLO6 Diversecity
PHY 221	P	P		P	P	
ENGR 211		P			P	
MATH 361		P			P	
MFG 112	P	P			P	
PHY 222	P	P		P	P	
ENGR 213		P		P	P	
ENGR 236		P			P	
ENGR 266		P			P	
MATH 36		P			P	
WRI 122	P					P
WRI 227	P					P
ENGR 326		P		P	P	
MECH 315		P			P	
MECH 360		P			P	
MET 375		P			P	
MFG 331	P	P		P	P	

ISLOs courses	ISLO1 communicate	ISLO2 Inquiry & Analyze	ISLO3 Ethical	ISLO4 Team	ISLO5 Qualitative Literacy	ISLO6 Diversecity
MECH 323		P			P	
MECH 316		P			P	
MECH 363		P		P	P	
MECH 318		P			P	
MECH 351		C			C	
MECH 360		P			P	
MFG 331		C			C	
MECH 437		P			P	
SPE 321						C
ENGR Elec	X	X	X	X	X	X
Project Mgmt	C					C
ANTH 452	C					C
ENGR 491	C	C	C	C	C	C
MECH 426		P			P	
MFG 454		P			P	
WRI 327	C			C		C

ISLOs courses	ISLO1 communicate	ISLO2 Inquiry & Analyze	ISLO3 Ethical	ISLO4 Team	ISLO5 Qualitative Literacy	ISLO6 Diversecity
MFG Elec	X	X	X	X	X	X
ENGR 492	C	C	C	C	C	C
MGT 345		P			P	
Hum	C		C		C	C
MECH Elective	X	X	X	X	X	X
MECH Elective	X	X	X	X	X	X
ENGR 415	C	C	C	C	C	C
ENGR 493	C	C	C	C	C	C
MECH 426		C		C	C	
MECH 316	P			P		
HUM	C		C			C

3. Cycle of Assessment of Student Outcomes

3.1 Introduction, Methodology, and the Assessment Cycle

The MMET 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 7. For each outcome, assessment data is collected via direct and indirect assessment measures.

In addition to the program 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 Assessment Committee. More information on institutional assessment is presented in section 2.7 , Institutional Assessment and ISLOs.

The correlation between programmatic student outcomes (1)-(7) and institutional ISLOs is presented in Table 7. In order to streamline the assessment process, effective 2022-23 the BSEE program assessment will be modified to match the current university ISLO assessment cycle. The last three columns of Table 7 show the new assessment cycle, with the MMET SO outcome assessment (shown as SO) overlapping with the ISLO outcome assessment.

Table 7: MMET Outcome Assessment Cycle. Year 2021-22 is the current year report and is shaded. SO indicates MMET SO assessment cycle. ISLO indicates ISLO assessment cycle.

Student Outcome	**2021-22**	2022-23	2023-24	2024-25	2026-27	2027-28
SO 1 Problem Solving (ISLO 2 Inquiry) (ISLO 5 quantitative literacy)			SO ISLO 2 ISLO 5			SO ISLO 2 ISLO 5
SO 2 Design (ISLO 3 ethical) (ISLO 6 diverse)		SO ISLO 3 ISLO 6			SO ISLO 3 ISLO 6	
SO 3 Communication (ISLO 1 communicate)	SO ISLO1			SO ISLO1		
SO 4 Experiment (ISLO 2 Inquiry)	SO			SO		
SO 5 Teamwork (ISLO 4 teams), (ISLO 6 diverse)	SO ISLO4			SO ISLO4		

3.2 Methodology for Assessment of Student Outcomes

At the beginning of Fall term, 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 7), as well as the courses and terms where these outcomes will be assessed. For each outcome, two direct assessment activities are typically planned from two different campus locations.

Direct assessment of student outcomes is performed as part of the course curriculum by means of assignments, exams, and course projects. 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) Limited or No Proficiency; (2) Some Proficiency; (3) Proficiency; (4) High Proficiency

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 are reviewed by the faculty at the annual closing-the-loop meeting, which takes place at the beginning of Fall term in the following academic year. 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 the assessment data indicates performance below the established level for any student outcome, that triggers the process of continuous improvement. Based on the evidence, the faculty decides on an adequate action plan. The possible courses of action are:

- 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.

Degree completion, retention and equity data are also collected by the university and annually reviewed by the program faculty as part of an initiative to identify and close equity gaps. This is done using the university's dashboards, which allow to track the 6-year graduation rates as well as the 1-year retention rates and sort this data along different demographic categories such as gender, race and socio-economic status. At the closing-the-loop meeting, program faculty review the equity data for their program to identify trends or equity gaps. Potential ways to address these are discussed and appropriate action plans are developed as needed.

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 MMET **assessment report**, which is reviewed by the department chair and submitted to the Office of Academic Excellence for review by the Executive Assessment Committee. If action plans include suggested changes to the curriculum, these 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.

4. Assessment Data

4.1 Direct Assessment

No assessment data available for the following SO's assessment

4.1.1 Direct Assessment of SO 3 Communication (ISLO 1 Communicate):

4.1.2 Direct Assessment of SO 4 Experiment (ISLO 2 Inquiry)

4.1.3 Direct Assessment of SO 5 Teamwork (ISLO 4 teams)

Note: ET program director should put the assessment SO's here.

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 level of 1 (lowest) to 4 (highest).

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 6 (Rubrics).

Note: ET program director should put the assessment SO's here.

A total of x BSMET students were assessed (KF: N = 0; PM: N = x; Seattle = x). The results are presented in Table 9. This outcome was assessed at the xx campus in the previous academic year (AY2020-21).

Portland Metro, course, by instructor X

This outcome was assessed in xx - course name. The course is about x.

The SO is listed here.

Table 8: Results of direct assessment for student outcome (x) xxx

Performance Criteria	1	2	3	4	%	
K. Falls						
PM						
Seattle						

4.2 **Indirect Assessment**

ESLO 1 :

Q ESLO 1 - Oregon Tech Essential Student Learning Outcomes										
Please rate your proficiency in the following areas.										
#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count			
1	ESLO 1a. Communication: Writing effectively	1.00	2.00	1.33	0.47	0.22	6			
2	ESLO 1b. Communication: Speaking effectively	1.00	2.00	1.67	0.47	0.22	6			
3	ESLO 2. Inquiry & Analysis: Thinking critically and analytically	1.00	3.00	1.67	0.75	0.56	6			
4	ESLO 3. Ethical Reasoning: Making ethical judgements	2.00	3.00	2.17	0.37	0.14	6			
5	ESLO 4. Teamwork: Work effectively with groups and teams	1.00	2.00	1.83	0.37	0.14	6			
6	ESLO 5. Quantitative Literacy: Using quantitative/numerical information to solve problems, evaluate claims, and support decisions	1.00	2.00	1.83	0.37	0.14	6			

7	ESLO 6. Diverse Perspectives: Understanding of diverse perspectives to improve interactions with others	1.00	3.00	1.83	0.69	0.47	6			
#	Question	High proficiency		Proficiency		Some proficiency		Limited proficiency		Total
1	ESLO 1a. Communication: Writing effectively	66.67%	4	33.33%	2	0.00%	0	0.00%	0	6
2	ESLO 1b. Communication: Speaking effectively	33.33%	2	66.67%	4	0.00%	0	0.00%	0	6
3	ESLO 2. Inquiry & Analysis: Thinking critically and analytically	50.00%	3	33.33%	2	16.67%	1	0.00%	0	6
4	ESLO 3. Ethical Reasoning: Making ethical judgements	0.00%	0	83.33%	5	16.67%	1	0.00%	0	6
5	ESLO 4. Teamwork: Work effectively with groups and teams	16.67%	1	83.33%	5	0.00%	0	0.00%	0	6
6	ESLO 5. Quantitative Literacy: Using quantitative/numerical information to solve problems, evaluate claims, and support decisions	16.67%	1	83.33%	5	0.00%	0	0.00%	0	6
7	ESLO 6. Diverse Perspectives: Understanding of diverse perspectives to improve interactions with others	33.33%	2	50.00%	3	16.67%	1	0.00%	0	6

ESLO2:

Q ESLO 2 - Oregon Tech Essential Student Learning Outcomes **How much has your experience at Oregon Tech contributed to your knowledge, skills, and personal development in these areas?**										
#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count			
1	ESLO 1a. Communication: Writing effectively	1.00	3.00	2.00	0.82	0.67	6			
2	ESLO 1b. Communication: Speaking effectively	1.00	3.00	2.33	0.75	0.56	6			
3	ESLO 2. Inquiry & Analysis: Thinking critically and analytically	1.00	2.00	1.67	0.47	0.22	6			

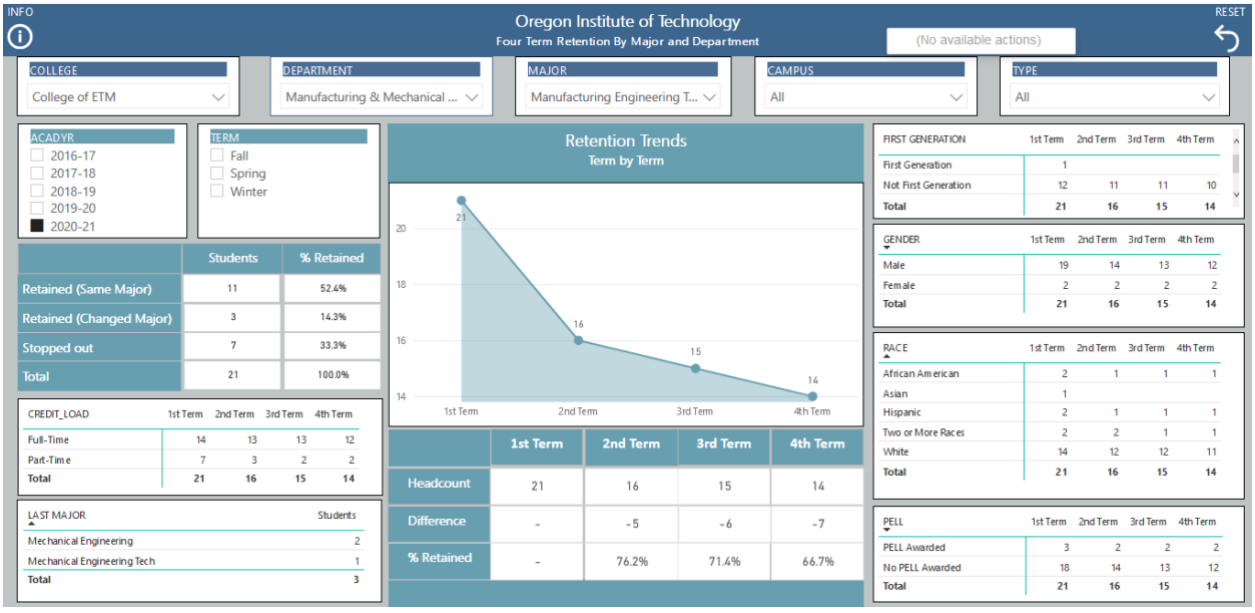
4	ESLO 3. Ethical Reasoning: Making ethical judgements	2.00	3.00	2.33	0.47	0.22	6			
5	ESLO 4. Teamwork: Work effectively with groups and teams	1.00	3.00	2.00	0.58	0.33	6			
6	ESLO 5. Quantitative Literacy: Using quantitative/numerical information to solve problems, evaluate claims, and support decisions	1.00	2.00	1.83	0.37	0.14	6			
7	ESLO 6. Diverse Perspectives: Understanding of diverse perspectives to improve interactions with others	2.00	4.00	2.67	0.75	0.56	6			
#	Question	Very much		Quite a bit		Some		Very little		Total
1	ESLO 1a. Communication: Writing effectively	33.33%	2	33.33%	2	33.33%	2	0.00%	0	6
2	ESLO 1b. Communication: Speaking effectively	16.67%	1	33.33%	2	50.00%	3	0.00%	0	6
3	ESLO 2. Inquiry & Analysis: Thinking critically and analytically	33.33%	2	66.67%	4	0.00%	0	0.00%	0	6
4	ESLO 3. Ethical Reasoning: Making ethical judgements	0.00%	0	66.67%	4	33.33%	2	0.00%	0	6
5	ESLO 4. Teamwork: Work effectively with groups and teams	16.67%	1	66.67%	4	16.67%	1	0.00%	0	6
6	ESLO 5. Quantitative Literacy: Using quantitative/numerical information to solve problems, evaluate claims, and support decisions	16.67%	1	83.33%	5	0.00%	0	0.00%	0	6
7	ESLO 6. Diverse Perspectives: Understanding of diverse perspectives to improve interactions with others	0.00%	0	50.00%	3	33.33%	2	16.67%	1	6

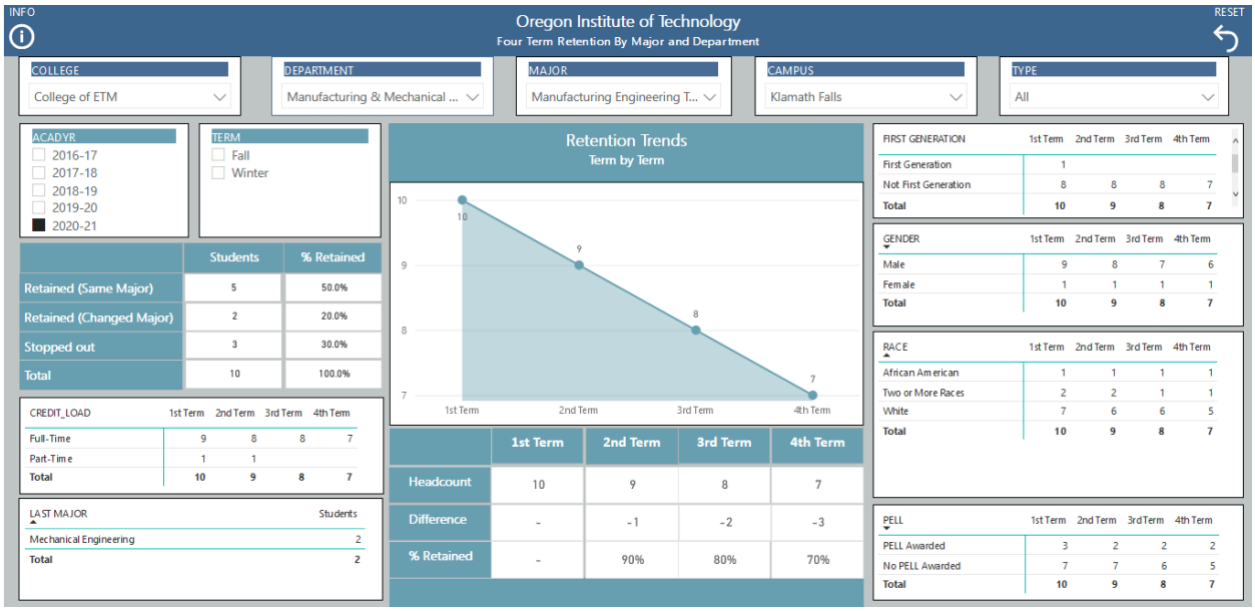
4.3 Degree Completion, Retention and Equity Data

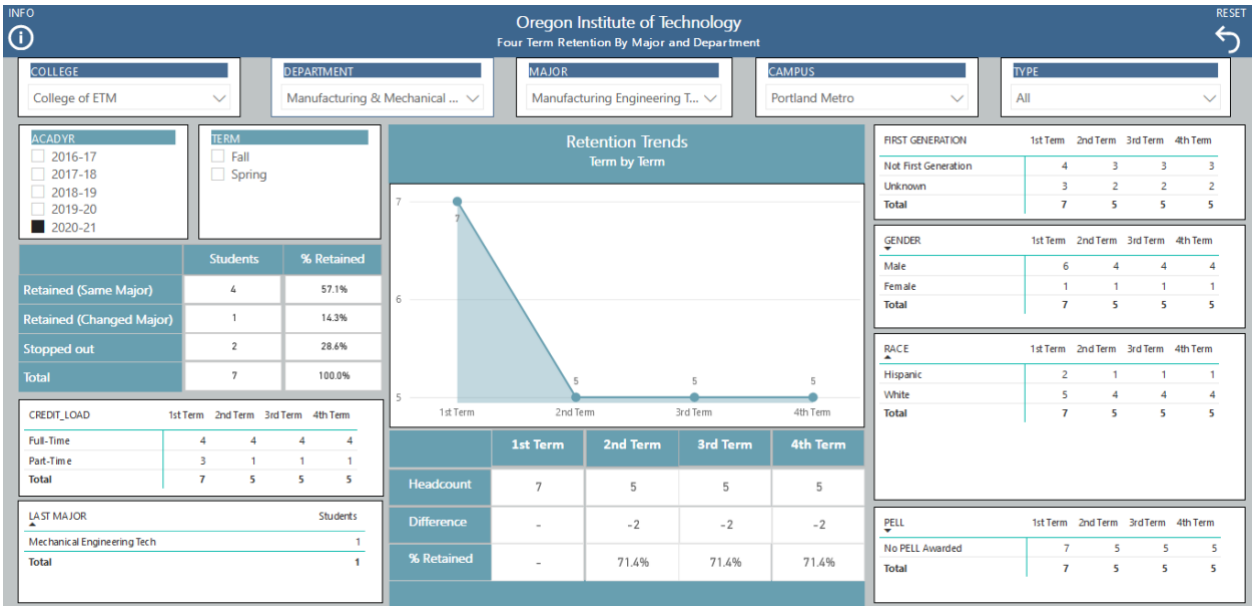
Assessment: the retention rate remains low for the BSMET program. Action plan is needed to improve this criterion.

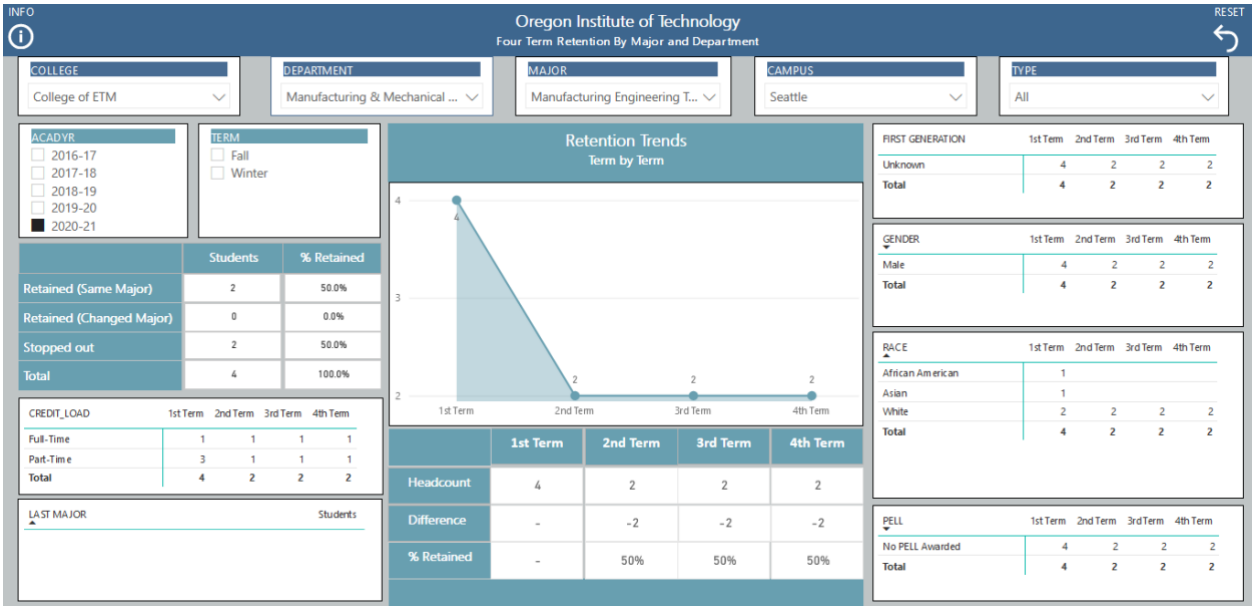
B.S. in Mechanical Engineering Technology
Graduation Data by Academic Year

	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Mechanical Engineering Technology	17	21	24	21	14	8
Klamath Falls	4	9	5	9	4	3
Portland-Metro	10	9	18	10	10	5
Seattle	3	3	1	2		0




INFO
Oregon Institute of Technology
Four Term Retention By Major and Department
RESET
COLLEGE
College of ETM
DEPARTMENT
Manufacturing & Mechanical ...
MAJOR
Manufacturing Engineering T...
CAMPUS
Klamath Falls
TYPE
All
ACADYR
2016-17
2017-18
2018-19
2019-20
2020-21
TERM
Fall
Winter
Students
% Retained
Retained (Same Major) 5 50.0%
Retained (Changed Major) 2 20.0%
Stopped out 3 30.0%
Total 10 100.0%
CREDIT_LOAD 1st Term 2nd Term 3rd Term 4th Term
Full-Time 9 8 8 7
Part-Time 1 1
Total 10 9 8 7
LAST MAJOR Students
Mechanical Engineering 2
Total 2
Retention Trends
Term by Term
10
9
8
7
1st Term
2nd Term
3rd Term
4th Term
1st Term 2nd Term 3rd Term 4th Term
Headcount 10 9 8 7
Difference - -1 -2 -3
% Retained - 90% 80% 70%
FIRST GENERATION 1st Term 2nd Term 3rd Term 4th Term
First Generation 1
Not First Generation 8 8 8 7
Total 10 9 8 7
GENDER 1st Term 2nd Term 3rd Term 4th Term
Male 9 8 7 6
Female 1 1 1 1
Total 10 9 8 7
RACE 1st Term 2nd Term 3rd Term 4th Term
African American 1 1 1 1
Two or More Races 2 2 1 1
White 7 6 6 5
Total 10 9 8 7
PELL 1st Term 2nd Term 3rd Term 4th Term
PELL Awarded 3 2 2 2
No PELL Awarded 7 7 6 5
Total 10 9 8 7


INFO
Oregon Institute of Technology
Four Term Retention By Major and Department
RESET
COLLEGE
College of ETM
DEPARTMENT
Manufacturing & Mechanical ...
MAJOR
Manufacturing Engineering T...
CAMPUS
Portland Metro
TYPE
All
ACADYR
2016-17
2017-18
2018-19
2019-20
2020-21
TERM
Fall
Spring
Students
% Retained
Retained (Same Major) 4 57.1%
Retained (Changed Major) 1 14.3%
Stopped out 2 28.6%
Total 7 100.0%
CREDIT_LOAD 1st Term 2nd Term 3rd Term 4th Term
Full-Time 4 4 4 4
Part-Time 3 1 1 1
Total 7 5 5 5
LAST MAJOR Students
Mechanical Engineering Tech 1
Total 1
Retention Trends
Term by Term
7
6
5
1st Term
2nd Term
3rd Term
4th Term
1st Term 2nd Term 3rd Term 4th Term
Headcount 7 5 5 5
Difference - -2 -2 -2
% Retained - 71.4% 71.4% 71.4%
FIRST GENERATION 1st Term 2nd Term 3rd Term 4th Term
Not First Generation 4 3 3 3
Unknown 3 2 2 2
Total 7 5 5 5
GENDER 1st Term 2nd Term 3rd Term 4th Term
Male 6 4 4 4
Female 1 1 1 1
Total 7 5 5 5
RACE 1st Term 2nd Term 3rd Term 4th Term
Hispanic 2 1 1 1
White 5 4 4 4
Total 7 5 5 5
PELL 1st Term 2nd Term 3rd Term 4th Term
No PELL Awarded 7 5 5 5
Total 7 5 5 5


INFO
Oregon Institute of Technology
Four Term Retention By Major and Department
RESET
COLLEGE
College of ETM
DEPARTMENT
Manufacturing & Mechanical ...
MAJOR
Manufacturing Engineering T...
CAMPUS
Seattle
TYPE
All
ACADYR
2016-17
2017-18
2018-19
2019-20
2020-21
TERM
Fall
Winter
Retention Trends
Term by Term
1st Term
2nd Term
3rd Term
4th Term
Students
% Retained
Retained (Same Major) 2 50.0%
Retained (Changed Major) 0 0.0%
Stopped out 2 50.0%
Total 4 100.0%
CREDIT_LOAD
Full-Time 1 1 1 1
Part-Time 3 1 1 1
Total 4 2 2 2
LAST MAJOR
Students
Headcount 4 2 2 2
Difference - -2 -2 -2
% Retained - 50% 50% 50%
FIRST GENERATION
Unknown 4 2 2 2
Total 4 2 2 2
GENDER
Male 4 2 2 2
Total 4 2 2 2
RACE
African American 1
Asian 1
White 2 2 2 2
Total 4 2 2 2
PELL
No PELL Awarded 4 2 2 2
Total 4 2 2 2

5. Continuous Improvement and Closing-the-Loop

The BSMET Closing-the-Loop meeting was held during Fall 2022 Convocation to review the assessment results. A summary of the discussions and action plans based on assessment results are presented in the following sections.

5.1 Summary of Assessment Plan

The BSMET faculty has mapped the objects to classes that best support it. The data collection plan was developed for data collection beginning in Winter 2023.

Table 9 shows data collection for AY2022-23.

Student Outcome	Campus	Course Number	Couse Name
SO 1 Problem Solving	KF	112	Introduction to Mfg Process
	PM	331	Industrial Controls
SO 2 Design	KF	343	Manufacturing Tool Design
	PM	343	Manufacturing Tool Design
SO 3 Communication	KF	343	Manufacturing Tool Design
	PM	333	Stat Methods Qual/Improv
SO 4 Experiment	KF	314	Geom Dimension/Tolerance
SO 5 Teamwork	KF	447	Lean

In each performance criteria. These results will be assessed each academic year from all three campus locations. The size of the data collection per campus depends on the number of class offerings at each campus. The objective set by the MMET department is to have at least 80% of the students perform at the level of accomplished in all performance criteria.

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 rubrics.

ETAC RUBRIC: OUTCOME (1) – Problem Solving

ETAC 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.

Performance Criteria	(1) Limited or No Proficiency	(2) Some Proficiency	(3) Proficiency	(4) High Proficiency	Score
1a) Identifies an engineering problem.	Does not identify the problem clearly.	Defines problem but has missing elements or does not include important information.	Adequately defines problem, including sufficient basic information.	Clearly identifies problem or reiterates given problem, including underlying principals and scope. Demonstrates depth of understanding.	
1b) Formulate a plan which will lead to a solution, including making appropriate assumptions.	Unable to develop a coherent plan to solve the problem. Does not identify assumptions or constraints, or makes errors in attempting to do so.	Develops a marginal plan with some important elements missing. Identifies some assumptions and constraints but important elements are missing.	Develops an adequate plan that leads to a plausible solution. Identifies basic assumptions and constraints.	Develops a coherent and concise plan to solve the problem with alternative strategies and a clear path to solution. Plan smoothly flows from problem statement and assumptions. Clearly delineates realistic constraints & important assumptions that affect solution. Includes assumptions that are workable, usable, and/or valid.	
1c) Identify the engineering principles that govern the performance of a given process or system, and use these to analyze the problem (utilizing appropriate hardware and software technology tools).	Unable to apply prerequisite engineering concepts to new problems. Makes significant errors in computation and/or logic. Does not use appropriate principals for analysis. Unable to select and apply appropriate technology tools or does not demonstrate	With extensive guidance, applies prerequisite engineering concepts to new problems. Computations may not include all important elements or steps. Order may not be logical and analysis incomplete with some elements missing. With extensive guidance, selects and properly applies appropriate technology tools. Demonstrates some understanding of tools selected.	Applies prerequisite engineering concepts to new problems, but may need some guidance. Correctly performs basic computations in a logical order. Performs basic analysis using appropriate principles to solve problems. Selects and properly applies appropriate technology tools, but may need guidance. Demonstrates basic understanding of tools selected	Independently applies prerequisite engineering concepts to new problems. Selects correct engineering principles. Performs computations in a logical order. Correctly applies analytical tools or techniques and analyzes problem in depth. Clearly solves the problem. Independently selects and properly applies appropriate technology tools. Demonstrates thorough understanding of tools selected.	
1d) Apply scientific principles that govern the performance of a given process or system in engineering problem(s).	Unable to apply prerequisite scientific concepts to new problems. Makes significant errors in computation and/or logic.	With extensive guidance, applies prerequisite scientific concepts to new problems. Computations may not include all important elements or steps. Order may not be logical.	Applies prerequisite scientific concepts to new problems, but may need some guidance. Correctly performs basic computations in a logical order.	Independently applies prerequisite scientific concepts to new problems. Selects correct scientific principles. Performs computations in a logical order.	
1e) Apply math principles to obtain analytical or numerical solution(s) to an engineering problem.	Unable to apply prerequisite math concepts to new problems. Make significant errors in computation and or logic.	With extensive guidance, applies prerequisite math concepts to new problems. Computations may not include all important elements or steps. Order may not be logical.	Applies prerequisite math concepts to new problems, but may need some guidance. Correctly performs basic computations in a logical order.	Independently applies perquisite math concepts to new problems. Selects correct math principles. Performs correct, thorough, clear computations in logical order.	

ETAC RUBRIC: OUTCOME (2) – Engineering Design

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

Performance Criteria	(1) Limited or No Proficiency	(2) Some Proficiency	(3) Proficiency	(4) High Proficiency	Score
2a) Identify an appropriate set of realistic constraints and performance criteria with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	No consideration of public health, safety or welfare. No consideration of any global, cultural, social, environmental or economic factors. A large number of codes, standards or performance criteria are missing or unclear.	Some consideration of public health, safety or welfare and/or global, cultural, social, environmental or economic factors. Is able to identify some codes & standards, but important elements are missing. Identifies & documents some performance criteria, but important elements are missing or unclear	Considers public health, safety or welfare and/or global, cultural, social, environmental or economic factors, but these considerations are limited or very basic. Presents basic relevant codes & standards. Identifies and documents performance criteria in a basic manner.	Prevents a multifaceted approach that fully considers the public health, safety and welfare as well as the global, cultural, social, environmental or economic factors. Thoroughly presents most important, relevant codes & standards applying to project. Clearly identifies & documents in-depth performance criteria.	
2b) Create a detailed design/solution within realistic constraints.	Is unable to create a design or solution with sufficient detail or documentation. Does not address constraints.	Design or solution has some, but inadequate detail or documentation or does not address constraints.	Creates design or solution with adequate detail and documentation. Incorporates and addresses constraints.	Applies engineering principles to solution. Creates design with high level of detail and appropriate documentation. Thoroughly addresses constraints.	
2c) Generate one or more creative solutions to meet the criteria and constraints.	Is unable to generate a creative, workable, usable, or realistic solution. Does not recognize constraints or identify criteria.	Generates a solution but does not demonstrate creativity or the ability to think through alternatives. Design may not be workable, useable or realistic. Misses important constraints or criteria.	Generates a basic solution demonstrating creativity in the design. Recognizes basic criteria and constraints.	Generates one or more workable, usable, or creative solutions. Demonstrates ability to see unique alternatives. Recognizes and addresses constraints thoroughly.	
2d) Plan and manage a small technical project.	Does not develop a task/timeline, does not implement project with success, or does not provide documentation. Does not meet deadline.	Defines task and timeline with some elements missing or unrealistic. Implements project but misses important elements. Documentation is provided but needs more detail. May not meet deadline.	Defines basic tasks and timelines, implements project, including testing and basic documentation, meets deadline.	Defines realistic and detailed tasks and timelines, implements project in exemplary fashion, performs thorough testing, documents important procedures or processes in detail, completes plan on time.	

ETAC RUBRIC: OUTCOME (3) – Communication

ETAC 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.

3a) Purpose and Audience	• Purpose is unclear or requires substantial inference from the audience. • Intended audience is unclear or overly broad. • The work would not be meaningful or useful to the intended audience. • The work omits or dismisses key audience concerns.	• Purpose may be inferred, but is not clearly stated • Minor changes in approach or medium would make the work more meaningful or useful to the intended audience. • Some content is too advanced/basic for the intended audience.	• Content serves a specific, identifiable purpose (e.g., inform, persuade, analyze). • Purpose and content are appropriate to the needs of a specific, identifiable, and appropriate audience. • Content is tailored to the level of expertise, authority, and values of the audience. • Communication medium (essay, memo, report, speech, etc.) matches purpose and audience	
3b) Focus and Organization	• Organizing element is underdeveloped, inconsistent, or missing. • Order and structure are unclear. • Digressions compromise or obscure the work's purpose. • Transitional elements are underdeveloped, inconsistent, or missing.	• Organizing element is present, but needs development (it is too broad, narrow, or trivial). • Minor gaps in organization detract from the effectiveness of the work. • Minor changes in organization would clarify the hierarchy of claims and information. • Minor changes in transition language would improve the work (transitions between key ideas are choppy or abrupt).	• Content is focused on a specific and appropriate organizing element: a thesis statement, purpose statement, or theme. • Content is organized so that ideas relate clearly to each other and to the organizing element. • Distinctions between major and minor claims are clear, providing consistent focus in content. • Transition language (and other organizing elements, such as headings or lists) throughout organizes ideas and guides audience understanding.	
3c) Support and Documentation	• The work includes frequent instances of unsupported claims or key missing details. • The work relies on evidence that lacks rigor, based on the audience's or discipline's standards. • The work relies on demonstrably biased evidence (without providing appropriate context or qualification of that evidence). • The work treats sources with bias, or demonstrates incomplete understanding of source material. • The work does not meet academic citation or	• The work includes few instances of claims unsupported by appropriate evidence. • Additional or more carefully chosen details would improve the work. • The work includes (but does not rely on) evidence that lacks rigor, based on the audience's or discipline's standards. • Additional context or discussion of credentials for sources of evidence would add value to the work. • The work contains few, minor documentation errors (according to academic citation style or disciplinary approach).	• Claims are consistently supported with appropriate, relevant, and specific evidence, whether drawn from disciplinary knowledge, careful reasoning, or credible research. • Evidence derived from sources supports and develops original content. • Source material is credible; it is introduced and interpreted to provide context. • Source material is documented accurately according to the appropriate conventions (academic citation style or disciplinary approach).	
3d) Style and Conventions	• (Where students have a choice in form or medium) the choice or form or medium is inappropriate to audience, purpose, or context. • Terminology, word choice, sentence structure, or tone are not in keeping with professional or academic expectations for the work. • Written: prevalent or distracting spelling, grammar, syntax, usage, and/or mechanics errors compromise the work's impact, credibility, or coherence. • Oral: prevalent or distracting verbal and/or non-verbal delivery issues compromise the work's impact, credibility, or coherence.	• (Where students have a choice in form or medium) a minor change in form or medium would make the work more accessible or engaging to the audience. • Minor changes in terminology, word choice, sentence structure, or tone would improve the work. • Written: the work contains minor, isolated errors in spelling, grammar, syntax, usage, and/or mechanics; an editing pass would improve the work. • Oral: the work contains minor, isolated issues in verbal and/or non-verbal delivery; additional preparation or practice would improve the work.	• Students deliver content in spoken, written, or visual forms and media, as appropriate to context. • Use of language (terminology and word choice, sentence structure, etc.) is clear and professional, demonstrating mastery of content and form. • Written: students demonstrate correct grammar, spelling, syntax, usage, and mechanics. • Oral: both verbal and nonverbal delivery demonstrate poise, preparation, mastery of material and audience awareness/ engagement.	
3e) Visual Communication (where appropriate)	• The work includes any visuals that are inappropriate to audience or context. • Necessary visuals are missing from the work. • Most (or all) visuals in the work serve a purely aesthetic purpose, and relate only tangentially to the work's purpose and content. • The work presents most (or all) visuals without context or interpretation. • The work presents most (or all) visuals without documentation (according to academic citation style or disciplinary approach).	• Minor changes in content, organization, or appearance would enhance the visuals in the work. • Additional or more carefully-chosen visuals would improve the work. • Some (but a minority of) visuals in the work serve a purely aesthetic purpose, and relate only tangentially to the work's purpose and content. • Additional context and interpretation of visuals would improve the work. • The work contains few, minor documentation errors of visuals, or the information presented in visual format (according to academic citation style or disciplinary approach).	• High quality visuals are employed to illustrate, contribute to, or develop content, and not for purely aesthetic appeal. • All visuals are appropriately introduced and interpreted. • All visuals are documented according to the appropriate conventions (academic citation style or disciplinary approach).	
3f) Justification (Self-Assessment)	• Student omits discussion of multiple ESLO criteria. • Student's self-evaluation is cursory, facile, or is compromised by lack of insight (student overlooks obvious deficiencies in the work). • Student demonstrates an inability or unwillingness to elicit or use feedback to improve the work.	• Student omits evaluation of one ESLO criterion. • Student's self-evaluation would be improved by a more rigorous analysis. • Student's self-evaluation addresses only process, or only product, but does not address both. • A more rigorous approach to eliciting and using feedback would improve the work.	• Articulate a clear rationale for communication choices (purpose and audience, focus and organization, support and documentation, style and conventions, and visual communication). • Self-assess the quality of their work (including process and product). • Elicit and effectively use feedback to improve their work.	

ETAC RUBRIC: OUTCOME (4) – Engineering Experimentation

ETAC 4: an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes

Performance Criteria	(1) Limited or No Proficiency	(2) Some Proficiency	(3) Proficiency	(4) High Proficiency	Score
6a) Ability to develop experiments	Has trouble identifying what parameters or physical phenomenon need to be measured	Can identify what physical parameters or phenomenon needs to be measured with some direction, but understanding of the reasons behind the choice are limited	Can identify what physical parameters or phenomenon that needs to be measured, but does not understand why.	Can identify what physical parameters or phenomenon needs to be measured. Understand the reasons behind the choices and can troubleshoot and provide alternative approaches as required.	
6b) Ability to conduct experiments	Has trouble carrying out pre-defined experiments.	Able to conduct experiments with some direction.	Able to set up and carry through pre-defined experiments obtaining useful data.	Able to conduct experiments obtaining solid data appropriate to the investigation at hand.	
6c) Ability to analyze and interpret data	Has difficulty analyzing experimental data. Presentation and reporting of results is confusing and hard to follow.	Able to analyze experimental data with general direction and guidance.	Ability to analyze experimental data. Can present and report results in an orderly and understandable manner.	Show ability to analyze experimental data independently extracting and presenting insightful results.	
6d) Ability to use experimental judgement to draw conclusions	Has trouble applying experimental results as a basis for conclusions.	Able to use results as a basis for conclusions with significant guidance.	Can use results to support conclusions, but these conclusions are simplistic and limited.	Can use results to support detailed and insightful conclusions. Counter-arguments are examined and alternative hypotheses proposed.	

ETAC RUBRIC: OUTCOME (5) – Teamwork

ETAC 5: an ability to function effectively as a member as well as a leader on technical teams

Performance Criteria	(1) Limited or No Proficiency	(2) Some Proficiency	(3) Proficiency	(4) High Proficiency	Score
5a) Identifies and achieves goal/purpose	Clear goals are not formulated or documented. Members don't accept or understand the purpose/task of the group. Group does not achieve goal.	Individuals share some goals but a common purpose may be lacking. Priorities may be unrealistic and documentation may be incomplete. Group may not achieve goal.	Group shares common goals and purpose. Some priorities may be unrealistic or undocumented. Group achieves goal.	When appropriate, realistic, prioritized and measurable goals are agreed upon and documented and all team members share the common objectives/purpose. Team achieves goal.	
5b) Assumes and fulfills roles and responsibilities as appropriate. Leadership strives to create a collaborative and inclusive environment.	Members do not fulfill roles and responsibilities. Leadership roles are not defined and/or shared. Members are not self-motivated and feel isolated. Assignments are not completed on time. Many members miss meetings.	Some members may not fulfill roles and responsibilities. Leadership roles are not clearly defined and/or effectively shared. Some members are not motivated and some assignments are not completed in a timely manner. Meetings rarely include most members.	Members often fulfil roles and responsibilities. Leadership roles are generally defined and/or shared. Generally, members are motivated and complete assignments in a timely manner. Many members attend most meetings.	Members consistently and effectively fulfill roles and responsibilities. Leadership roles are clearly defined and/or shared. Members move team goal by giving and seeking information or opinions and assessing ideas and arguments critically. Members are all self-motivated and complete assignments on time. Most members attend all meetings.	
5c) Interacts and communicates effectively with team/group members.	Members do not communicate openly and respectfully. Members do not listen to each other. Communication patterns undermine teamwork.	Members may not consistently communicate openly and respectfully. Members may not listen to each other.	Members usually communicate openly and respectfully. Members often listen to most ideas. Members usually support and encourage each other.	Members always communicate openly and respectfully. Members listen to each other's ideas. Members support and encourage each other. Communication patterns foster a positive climate that motivates the team and builds cohesion and trust.	
5d) Reconcile disagreement	Members do not welcome disagreement. Difference often results in voting. Subgroups are present.	Few members welcome disagreement. Difference often results in voting. Some members respect and accept disagreement and work to account for differences. Subgroups may be present.	Many members welcome disagreement and use difference to improve decisions. Most members respect and accept disagreement and work to account for differences. Subgroups rarely present.	All members welcome disagreement and use difference to improve decisions. All members respect and accept disagreement and employ effective conflict resolution skills. Subgroups absent.	
5e) Share appropriately	Contributions are unequal. Certain members dominate discussions, decision making, and work. Some members may not contribute at all. Individuals work on separate sections of the work product, but have no coordinating effort to tie parts together.	Contributions are unequal although all members contribute something to discussions, decision making and work. Coordination is sporadic so that the final work of product is uneven quality.	Many members contribute to discussions, decision-making and work. Individuals focus on separate sections of the work product, but have a coordinator who ties the disparate parts together (they rely on the sum of each individual's work).	All members contribute significantly to discussions, decision making and work. The work product is a collective effort: team members have both individual and mutual accountability for the completion of the work product.	
5f) Develop strategies for effective action	Members seldom use decision making processes to decide on action. Individuals often make decisions for the group. The group does not share common norms and expectations for the outcomes. Group fails to reach consensus on most decisions. Group does not produce plans for action.	Members sometimes use decision making processes to decide on action. Some of the members of the group do not share norms and expectations for outcomes. Group sometimes fails to each consensus. Plans for action are informal and often arbitrarily assigned.	Members usually use effective decision making processes to decide on action. Most of the group shares norms and expectations for outcomes. Group reaches consensus on most decision and produces plans for action.	Members use effective decision making processes to decide on action. Group shares a clear set of norms and expectations for outcomes. Group reaches consensus on decisions and produces detailed plans for action.	
5g) Documentation and record keeping	No formal method or process for recording group decisions. Information is scattered and not accessible to group members.	An attempt has been made to keep records, but the format has missing elements and the documentation is incomplete or unclear.	A method or process exists for recording group decisions and results in understandable and usable documentation.	A method or process exists for recording group decisions which are shared and understood by all group members. Information about decisions is readily accessible and the final documentation is polished and organized.	
5h) Cultural adaptation	Members do not recognize differences in background or communication style.	Members may recognize, but do not adapt to differences in background and communication style.	Members usually recognize and adapt to differences in background and communication style.	Members always recognize and adapt to differences in background and communication style.	

6. Raw Assessment Data

The MMET department stores all data used for direct and indirect assessment in the **BSMET_BSMFG_Programs** folder on *Teams*. The documentation in the folder includes, for every direct and indirect 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.