B. S. in Manufacturing

Engineering Technology

2021–22 Assessment

Report

Manufacturing and Mechanical Engineering &
Technology Department
Fall 2022

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

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

Contents

1 Introduction

1.1 Background

The objective of the Manufacturing Engineering Technology undergraduate program is to offer students a quality education that provides the greatest possible opportunity for rewarding and successful careers. This includes practical training and technical education in engineering, manufacturing processes, and manufacturing equipment as well as supplemental coursework in communications, mathematics, science, social science, and business.

Graduates of the Manufacturing Engineering Technology degree program are prepared to excel and advance in a wide variety of manufacturing positions at Boeing. These include production engineer, process engineer, process development engineer, tooling design engineer, quality control engineer, and other vital manufacturing areas.

1.1.1 B.S. Manufacturing Engineering Technology

In today's concurrent engineering environment, manufacturing engineers are called upon to perform a wide range of tasks, from designing and purchasing manufacturing equipment to improving and troubleshooting the manufacturing process. Manufacturing engineers are involved in the design and continuous improvement of product design, manufacturing equipment, and production tooling. The manufacturing engineering curriculum provides education in a variety of areas including:

- Manufacturing processes
- Robotics and automation
- Industrial controls
- Manufacturing tool design
- Computer-aided design and manufacturing
- Engineering materials
- Manufacturing planning
- Quality control

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.

Any Boeing employee can elect to take any classes offered through the program as non-admitted students without entering a specific program (if a course has prerequisites, an official transcript must be provided to show completion of the coursework).

1.1.2 M.S. Manufacturing Engineering Technology

Oregon Tech Seattle provides an at-work solution to obtaining a graduate degree at the Masters level in Manufacturing Engineering Technology, exclusively for Boeing employees.

The Oregon Tech Seattle program has extended the educational opportunities offered to Boeing employees to include a Master of Science in Manufacturing Engineering Technology. This program is designed to provide practicing engineers with additional skills and understanding of today's evolving manufacturing industry. As with the Oregon Tech Seattle Bachelor's program, our faculty have extensive industry experience, and most are practicing engineers working in the aerospace industry.

1.2 Program History

The Manufacturing Engineering Technology (MFG) Program at Oregon Institute of Technology (Oregon Tech) was first accredited by ABET in 1985. 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 Orientation 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 BSMFG 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 located 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 BSMFG 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 MFG program with respect to curriculum content, instructional resources, career guidance and placement activities, accreditation reviews, and professional- development assistance. In addition, each advisory-committee member serves as a vehicle for public relations information and potentially provides a point of contact for the development of specific opportunities with industry for students and faculty.

The IAB and the program faculty meet once or twice per year (typically Fall and Spring terms). At these meetings, faculty have an opportunity to provide and update on the state of the department and its programs, as well as receiving input and feedback from the IAB on any new departmental initiatives in light of the current industry trends and needs. The IAB periodically reviews the program PEOs and SOs to ensure they remain relevant and responsive to the needs of industry. Program changes are also reviewed by the IAB before implementation.

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

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

The constituencies for the MFG 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 MFG program quality so all those listed above are influential and direct/guide the program as a whole.

1.5 Program Enrollment and Graduation Data

Table 1 presents the BSMFG program enrollment from Fall 2018 to Fall 2022. Table 2 presents the number of BSMFG degrees awarded over the same time span. Based on a rolling average of survey data collected for the BSMFG graduating classes, 92% of BSMFG graduates are employed and several are involved in continued education within six months after graduation. The median salary of BSEE graduates is reported as $61,500. Current employers of BSMFG graduates include Boeing, Erikson Air Crane, FLIR Systems, ATS Automation, Audix Corporation Warn Industries.

Table 1: BSMFG 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	38	33	38	32	31
Portland-Metro	19	23	23	23	20
Seattle-Boeing	15	7	6	11	13

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

	2017-18	2018-19	2019-20	2020-21	2021-22
Klamath Falls	8	7	5	7	7
Portland-Metro	2	3	1	3	2
Seattle-Boeing	1	2	2	0	1

2 Program Mission, PEOs and SOs

2.1 Program Mission

The Manufacturing 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 Manufacturing Engineering Technology.

2.2 Program Educational Objectives

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 MFG 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 MFG 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 BSMFG 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 Manufacturing 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 MFG 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 BSMFG 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 BSMFG 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 MFG 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:

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.

Table 4: BSMFG PEO and SO Review Process

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 Learn- ing 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 BSMFG 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 BSMFG SO's to the ISLO's.

Table 5: Mapping between BSMFG and ISLO's

Oregon Tech ISLO	BSMFG 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 BSMFG Curriculum to SO's and ISLO's

Table 6 shows the mapping of the BSMFG 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 BSMFG 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 362		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 313	P	P		P	P	

ISLOs courses	ISLO1 communicate	ISLO2 Inquiry & Analyze	ISLO3 Ethical	ISLO4 Team	ISLO5 Qualitative Literacy	ISLO6 Diversecity
MFG 341		P			P	
MECH 316		P			P	
MECH 363		P		P	P	
MFG 333		P			P	
MFG 342		C			C	
MFG 343		C			C	
MFG 331		C			C	
MFG 344		C			C	
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
MFG 453		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
MFG Elective	X	X	X	X	X	X
MFG 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	
MFG 447	C			C		C
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 through the use of 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.

Note: ET program director should put the rest of the information here?

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):
template

Outcome (2) Design/Broader Factors

Outcome assessed in ENGR xxx (K. Falls, Seattle, PM).

Direct and indirect assessments suggest outcome met. (Table x)

Action Plan: Will reassess in AY2022-23 as part of ISLO assessment cycle (ISLO6 Diverse

Perspectives). Courses: ENGR xxx (KF and PM). Must ensure broader fac- tors/diverse perspectives component is included as part of the final capstone project report. **Person in Charge, Deadline:** xxx i (KF), xxx (PM), Winter 26

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

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

The following student outcomes were assessed in the 2021-22 academic year in the courses indicated:

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).

4.1.1 Direct Assessment of ET program director to put SO here.

xxx

A total of x MFG 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

The MMET department conducted assessments of ISLO during the 2021-2022 academic year, and two ISLO's (ISLO #1 Communication and ISLO #4 Teams).

The results for these assessments for the three campuses are shown below.

In addition to direct assessment measures, student outcomes (1)-(5) were indirectly assessed through a senior exit survey of graduating students. Data for this survey was not broken down by campus, so the indirect assessments are shown for the BSMFG Program as a whole. It is recommended that in the future the indirect assessment data should be separated by campus.

A total of 4 students gave responses to this survey. Also, the BSMFG Program's goal is to have 80% of our students score at a 3 or 4 level on a 1-4 scale. The scale used for this exit survey was 1-5. For purposes of this report we have set the goal of 80 % of the students scoring at a 4 or a 5; plus ½ of the students scoring at a 3.

PSLO #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.

Indirect Assessment (combined all campuses):
The exit survey showed that out of the 4 responses, the students rated themselves as follows on a 1-5 scale (with 1 being the lowest and 5 the highest), see Table # below:

BSMFG PSLO #1	Number of Students	%
1	0	0%
2	0	0%
3	1	25%
4	2	50%
5	1	25%
Total	4	100%

Table # PSLO #1 Indirect Assessment Results

There were 3 students scoring at a 4 or 5 level; and adding in ½ of the students scoring at a 3 level gives 3.5 out of 4 students, which is 87.5%. This is above the 80% level set by the BSMFG Program, and indicates that from a student's perspective there is no action required at this point of time.

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

Indirect Assessment (combined all campuses):
The exit survey showed that out of the 4 responses, the students rated themselves as follows on a 1-5 scale (with 1 being the lowest and 5 the highest), shown in Table # below:

BSMFG PSLO #2	Number of Students	%
1	0	0%
2	0	0%
3	0	0%
4	4	100%
5	0	0%
Total	4	100%

Table # PSLO #2 Indirect Assessment Results

There were 4 students scoring at a 4 level. This is above the 80% level set by the BSMFG Program, and indicates that from a student's perspective there is no action required at this point of time.

PSLO #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.

Indirect Assessment (combined all campuses):
The exit survey showed that out of the 4 responses, the students rated themselves as follows on a 1-5 scale (with 1 being the lowest and 5 the highest), shown in Table # below:

BSMFG PSLO #3	Number of Students	%
1	0	0%
2	0	0%
3	0	0%
4	3	75%
5	1	25%
Total	4	100%

Table # PSLO #3 Indirect Assessment Results

There were 4 students scoring at a 4 or 5 level. This is above the 80% level set by the BSMFG Program, and indicates that from a student's perspective there is no action required at this point of time.

PSLO #4 an ability to conduct standard tests, measurements, and experiments and to analyze and interpret the results to improve processes.

Indirect Assessment (combined all campuses):
The exit survey showed that out of the 4 responses, the students rated themselves as follows on a 1-5 scale (with 1 being the lowest and 5 the highest), shown in Table # below:

BSMFG PSLO #4	Number of Students	%
1	0	0%
2	0	0%
3	1	25%
4	3	75%
5	0	0%
Total	4	100%

Table # PSLO #4 Indirect Assessment Results

There were 3 students scoring at a 4 level; and adding in ½ of the students scoring at a 3 level gives 3.5 out of 4 students, which is 87.5%. This is above the 80% level set by the BSMFG Program, and indicates that from a student's perspective there is no action required at this point of time.

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

Indirect Assessment (combined all campuses):
The exit survey showed that out of the 5 responses, the students rated themselves as follows on a 1-5 scale (with 1 being the lowest and 5 the highest), shown in Table # below:

BSMFG PSLO #5	Number of Students	%
1	0	0%
2	0	0%
3	2	50%
4	2	50%
5	0	0%
Total	4	100%

Table # PSLO #5 Indirect Assessment Results

There were 2 students scoring at a 4 level; and adding in ½ of the students scoring at a 3 level gives 3.0 out of 4 students, which is 75%.

ISLO #1 Communication and ISLO #4 Teams

NO DATA

4.3 Degree Completion, Retention and Equity Data **(we don't know where to get the updated result or who is in charge of updating these results)**

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

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

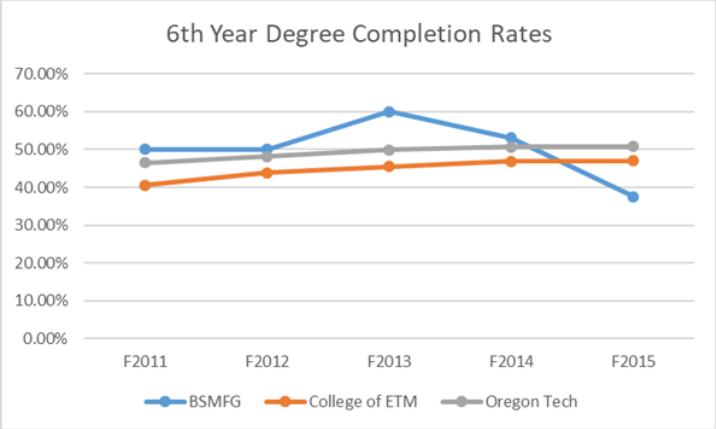


Figure 1: 6-year completion rates for students who started at Oregon Tech in Fall 2011 through Fall 2015.

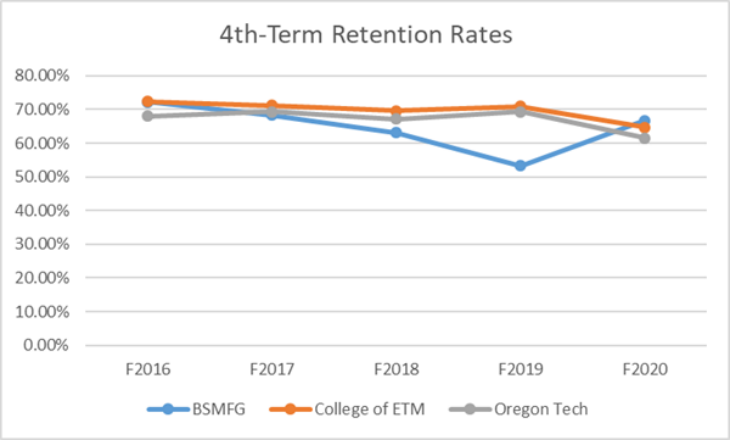


Figure 2: 4th term retention rates for students who started at Oregon Tech in Fall 2015 through Fall 2019.

For the 6-year degree completion rate, the BSMFG program seems to follow a similar pattern to the College of ETM and the overall university, with slightly higher values in 2013. The figure shows a divergence between the BSMFG values and the college and university values for Fall 2015. Looking at the dashboard data, the MMET faculty could not identify any obvious reason for this.

For the 4th term retention rate, the BSMFG program has followed the trends for the College of ETM and the university except for Fall 2019. Looking at the dashboard data, the MMET faculty could not identify any obvious reason for this.

From the current dashboards, it was difficult to extract meaningful information regarding equity in the degree completion and retention rates. The main problem is that the data is currently displayed as absolute numbers, instead of proportions or percentages. For example, out of the 26 students who started their BSMFG degree in Fall 2015, 8 students graduated in 6 years. Per the dashboard, 0 out of these 8 were classified as "female" and 8 as "male". Since the composition of

the BSMFG student body is not symmetrical with regards to gender (with males significantly outnumbering females), it is expected that the absolute number of males completing their degree within 6 years will exceed the number of females. Without knowing the male/female proportion in the original cohort of 26 students, it is difficult to establish whether there is an equity gap between the degree completion rates based on gender. This same principle applies to all equity categories.

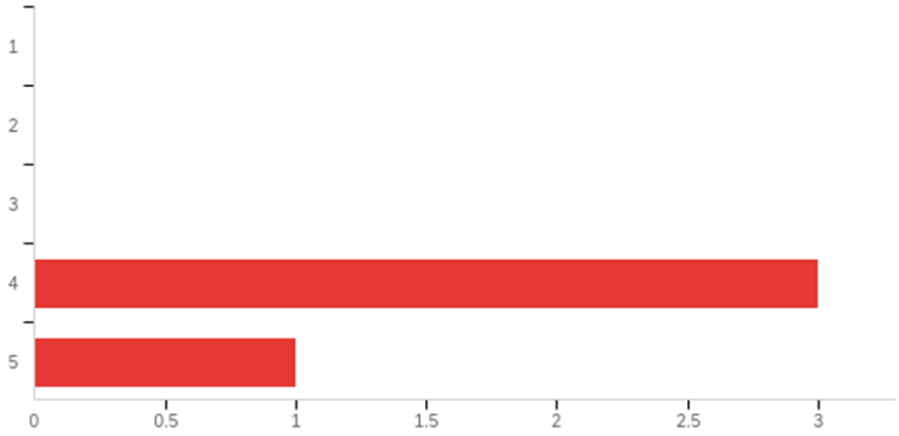
Indirect Assessment (NO edit, Irina, Wangping)

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

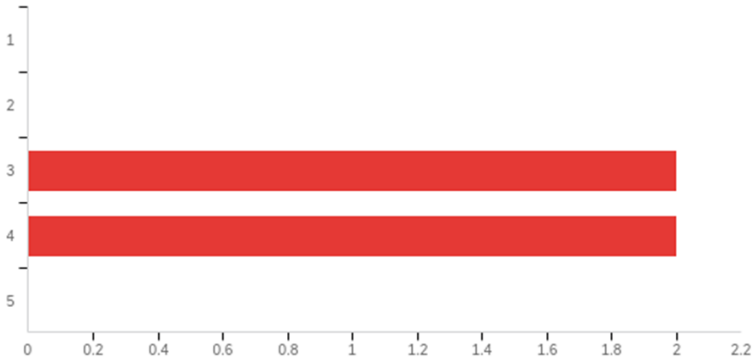
No assessment data available for the following SO's assessment

4.3.1 Indirect Assessment of SO 3 Communication (ISLO 1 Communicate):

Exit Survey of MFG program of 21-22 is used for this part.
Q BMAN 7 - Students must develop the 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.
Result Assessment: satisfactory (80% scored 3 and above)



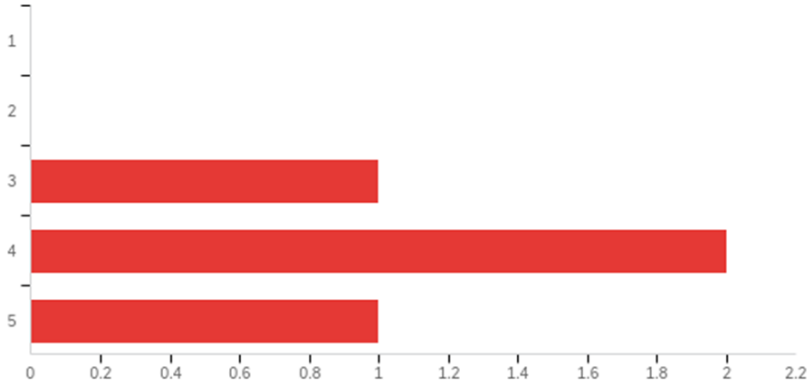
- Q BMAN 12 - Students must develop the ability to function effectively as a member, as well as a leader, on technical teams. Please rate your preparation in developing the social and interpersonal skills necessary for you to be an effective member of a multi-discipline team or task force in your work after graduation.
  Result Assessment: satisfactory (80% scored 3 and above)



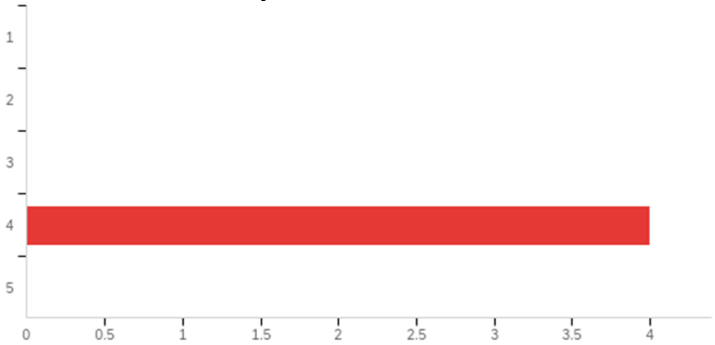
4.3.1 Indirect Assessment of SO 4 Experiment (ISLO 2 Inquiry)

Exit Survey of MFG program of 21-22 is used for this part.

- Q. BMAN 1: A key element in this preparation is to assist students to master a set of specific skills. In Part 1, you are asked to evaluate how successful the department has been in helping you achieve these skills.
  Result Assessment: satisfactory (80% scored 3 and above)

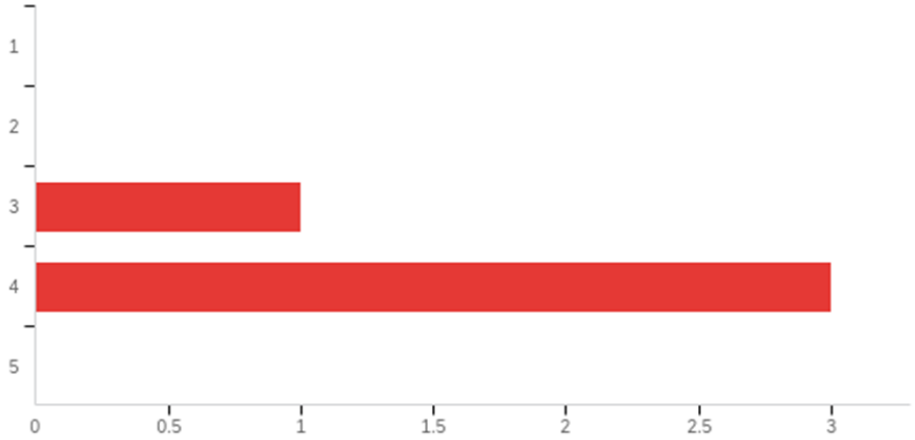


- Q BMAN 4 - Students must develop the ability to design systems, components, or processes meeting specified needs for broadly-defined engineering problems appropriate to the discipline.
  Result Assessment: satisfactory (80% scored 3 and above)



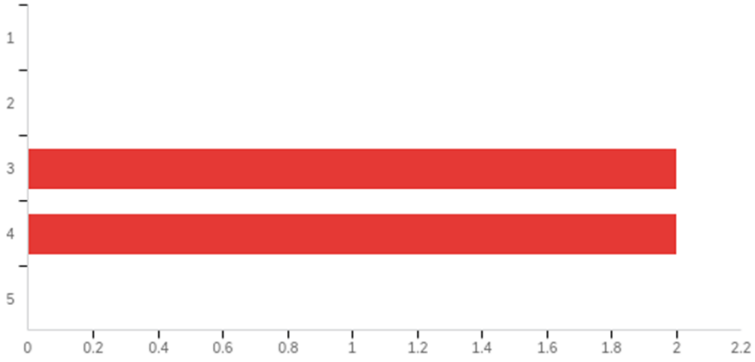
- Q BMAN 10 - Students must develop the ability to conduct standard tests, measurements,

and experiments and to analyze and interpret the results to improve processes.
Result Assessment: satisfactory (80% scored 3 and above)



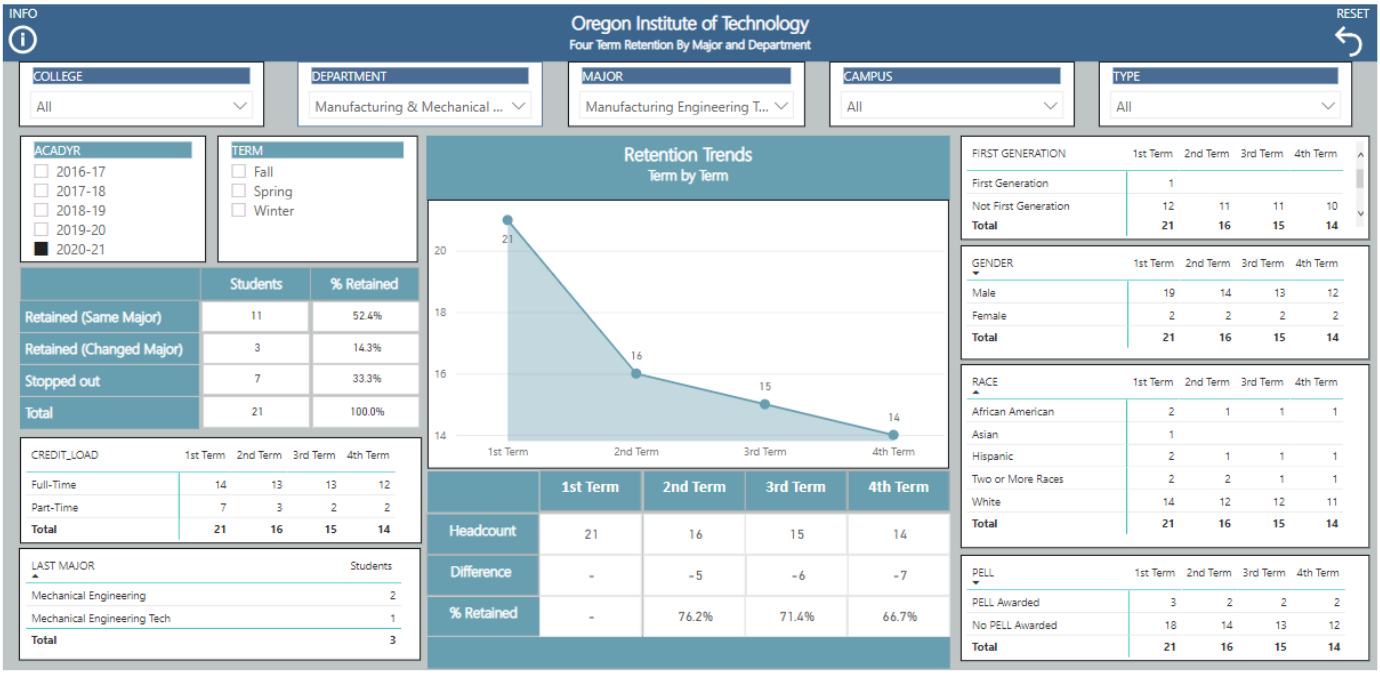
4.3.2 Indirect Assessment of SO 5 Teamwork (ISLO 4 teams)
Exit Survey of MFG program of 21-22 is used for this part.

- Q BMAN 12 - Students must develop the ability to function effectively as a member, as well as a leader, on technical teams. Please rate your preparation in developing the social and interpersonal skills necessary for you to be an effective member of a multi-discipline team or task force in your work after graduation.
  Result Assessment: satisfactory (80% scored 3 and above)



Degree Completion, Retention and Equity Data

The retention data of 20-21 is displayed below. The fourth year retention is 66.7%.



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

As per the graduate data provided by the Registrars Office, 10 students were conferred with MFG BS degree in the year of 2020-2021 and 2021-2022 respectively.

Bachelors

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Manufacturing Engineering Tech	13	5	11	12	22	11	12	8	10	10

Assessment: degree completion remains stable over the years. Action that incorporates with the retention rate improvement is needed to be in place.

5. Continuous Improvement and Closing-the-Loop

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

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

Table 13 shows data collection for AY2022-23.

Assessment: due to no ET Program Director being in position, the assessment of 21-22 was not done. So, no data available for assessment.

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.

5.3 Review of Implementation of Changes from Prior Assessments questions to Cliff

Below is the status of implementation of recommendations for changes based on prior assessments.

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 *xxx* folder on Teams. The raw data for the BSMFG direct assessments performed in AY2021-22 can be found in the folder *xxx*. 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.to be confirmed on Teams