Bachelor of Science in Mechanical Engineering (BSME)
2022 - 2023 Program Assessment Report

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1. Program Mission and Educational Objectives

The mission statement of the Mechanical Engineering (ME) Program is in-line with and built upon the mission statements of both the Institution and the Department. The ME program's Mission Statement and Program Educational Objectives are stated as:

Mechanical Engineering Program Mission Statement

The Mechanical Engineering Bachelor of Science program at Oregon Institute of Technology is an applied engineering program. Its mission is to provide graduates the skills and knowledge for successful careers in mechanical engineering or related fields.

Program Educational Objectives (PEO)

The program expects graduates to achieve, within several years of graduation, the following objectives. Mechanical Engineering graduates will have:

- demonstrated the ability to analyze, design and improve practical thermal and/or mechanical systems.
- showed the ability to communicate effectively and work well on team-based engineering projects.
- succeeded in mechanical engineering positions.
- pursued continued professional development, including professional registration if desired.
- successfully pursued engineering graduate studies and research if desired.

2. Program Description and History

Program History

The Mechanical Engineering (ME) Program at Oregon Institute of Technology (Oregon Tech) was implemented in fall 2005. It gained initial accreditation by the Engineering Accreditation Commission (EAC) of ABET in fall 2009. Subsequently the program was visited in 2011 and its accreditation continued. The accreditation of the ME program was extended to the Oregon Tech campus in the Seattle, WA area in 2013; and to the Portland-Metro campus in 2018. Enrollment trends from 2019 – 2024 have varied from 328 to 378 students per year in the program.

Program Location: The BSME program is delivered at three campuses within the University –

Klamath Falls, Portland-Metro (in Wilsonville) and Seattle. The MMET Department's other two degree programs (the Bachelor of Science in Mechanical Engineering Technology, BSMET and the Bachelor of Science in Manufacturing Engineering Technology, BSMFG) share a number of common courses with the BSME and thus faculty input from the staff on these programs is also considered when assessing the effectiveness of several Departmental courses.

Program Enrollment:

The program enrollment for each campus, and the program total, are shown below in Table 1 for the last 5 years. Also shown in the % Change in these numbers over the 5-year period.

	2017-18	2018-19	2019-20	2020-21	2021-22	5 Year Difference	5Year % Change
Klamath Falls	241	239	248	240	242	1	0.4%
Portland-Metro	29	68	67	68	62	33	114%
Seattle	88	74	63	33	38	-50	-57%
Total	358	381	378	341	342	-16	-4%

Table 1 BSME Program 5-Year Enrollment Data

Program Graduates:

The program graduates for each campus, and the combined total are shown below for the last 5 years.

	2017-18	2018-19	2019-20	2020-21	2021-22
Klamath Falls	37	38	35	38	44
Portland-Metro	1	3	8	15	12
Seattle	15	14	12	15	9
Total	53	55	55	68	65

Table 2 BSME Program 5-Year Graduate Data

Employment Rates and Salaries:

The Employment rates and salaries for Oregon Tech BSME students shown below. These numbers are the combined results for the 2019/2020/2021 graduating classes.

% Employed	% Continuing Education	% Seeking	% Not Seeking	Medium Salary	Success Rate
96%	1%	3%	1%	$70,000	97%

Table 3 BSME Program Employment Rates and Salaries

3. Program Student Learning Outcomes

The PSLO's for the BSME degree are shown below, and are based on the ABET EAC 1-7 Criterion 3 outcomes.

Upon graduating from the BSME program at Oregon Tech, students should possess:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

4. Curriculum Map

The mapping of the PLSO to the course curriculum are shown below. The BSME PLSO's are closely aligned with the Oregon Tech ESLO's, and are mapped approximately as shown below for the purpose of identifying which BSME program courses which support the Oregon Tech ESLOs. The BSME Program uses the terminology of "Introduced", "Reinforced", and "Emphasized"; which corresponds to the Oregon Tech terms of "Foundation", "Practice", and "Capstone" respectively.

BSME PLSO	Oregon Tech ESLO
1. An ability to solve problems	Quantitative Literacy and Reasoning
2. An ability to apply designs	Diverse Perspectives
3. Communication	Communications
4. Ethics	Ethics and Reasoning
5. Teamwork	Teamwork
6. Experimentation	--
7. Apply Knowledge	Inquiry and Analysis

Table 4 BSME Program PLSO to ELSO Course Outcome Mapping

Freshman Year

Fall
CHE 201 - General Chemistry I
CHE 204 - General Chemistry I Lab
ENGR 111 - MMET Orientation
WRI 121Z - Composition I
Humanities/Social Science Elective
Math (Algebra if required)

Winter
CHE 202 - General Chemistry II
CHE 205 - General Chemistry II Lab
COM 111Z - Public Speaking
Hum/Soc-Sci Elective
Math (Trigonometry if required)

Spring
MATH 251 - Differential Calculus
MFG 120 - Intro Machining Proc
MET 241 - CAD for Mechanical Design I
Economics Elective

Junior Year

Fall

MATH 341 - Linear Algebra I	
MECH 318 - Fluid Mechanics	SO 2,6
MECH 363 - Engineering Inst.	SO 1,2,6
MET 375 - Solid Modeling	
Statistics Requirement	

Winter

ENGR 212 - Dynamics	SO 2
ENGR 326 – Elec. Pwr Sys.	SO 6
ENGR 355 - Thermodynamics	SO 1,2
MECH 315 - Machine Design I	SO 1,2,4
MECH 360 - Engineering Mtls II	SO 1,3,6
SPE 321 - Sml Grp/Team Comm	SO 3,4

Spring

HUM 125 - Intro Tech, Soc, Vals	SO 7
MECH 313 - Thermodynamics II	SO 1,2,4
MECH 316 - Machine Design II	SO 1,2,3,5
MECH Elective (MECH 307/407)	

ABET SO 1-7: Upper-Level BSME Courses appropriate for collecting/scoring data.

Sophomore Year

Fall
MATH 252 - Integral Calculus
MECH 260 - Engineering Materials I
MET 242 - CAD for Mechanical Design II
PHY 221 - General Physics w/Calculus
WRI 122Z - Composition II -or-
WRI 227Z - Technical Writing

Winter
ENGR 211 - Engineering Mechanics: Statics
MATH 254 - Vector Calculus I
MFG 314 - Geom Dimension/Tolerance
PHY 222 - General Physics w/Calculus

Spring
ENGR 213 - Engr Mech: Strength of Mat
ENGR 236 - Fund of Elec Circuits
ENGR 266 - Engineering Computation
MATH 321 - Appl Diff Equation I
PHY 223 - General Physics w/Calculus

Senior Year

Fall

ENGR 491 - MMET Sen. Proj. I	SO 1-7
MECH 323 - Heat Transfer I	SO 1,3,6
MECH 351 – Fin. Elem. Anal.	SO 1
WRI 327 – Adv. Tech Writing	SO 3,4
Fluid Mech. II (MECH 417/18)	SO 1,2

Winter

ENGR 492 - MMET Sen. Proj. II	SO 1-7
MECH 437 - Heat Transfer II	SO 1,3,5,6
MECH 480 – Mech. Vibrations	SO 1,3,5,6
PHIL 331 - Ethics / Professions	SO 4
Hum/SocSci Elective	
MECH Elective (MECH 307/407)	

Spring

ENGR 493 - MMET Sen. Proj. III	SO 1-7
MECH 436 – Class. Ctrl Sys.	SO 1,2,5,6
Hum /SocSci Elective	
MECH Elective (MECH 307/407)	

Required to Graduate with BSME Degree: 180 Credit Hours

5. Three-Year Cycle for Assessment of Student Learning Outcomes

The BSME program is using a three-year assessment cycle for its SLOs, with the assessment cycle being the same for all three campuses.

Assessment Criteria	21/22	22/23	24/25
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.		✓	
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.		✓	
3. an ability to communicate effectively with a range of audiences.	✓		✓
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	✓		✓
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	✓		✓
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.		✓	
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.		✓	

Table 5: Three-year PLSO assessment cycle timetable

6. Assessment Activities Undertaken

Student Outcomes Assessment and Continuous Improvement Summary Tables

Table 3.2 - The B.S. in Mechanical Engineering Continuous Improvement Using Student Outcomes and Assessment Results

EAC SO 3: an ability to communicate effectively with a range of audiences. **PM Campus Assessment of BSME Program for SO 3**								
Courses corresponding to the SO	Course(s) used for assessment	Performance Indicators	Assessment Method	Cycle of Assessment	Year/Semester of Assessment	Target	Results	Documents
MECH 417 MECH 436 MECH 437 MECH 480 MECH 318 MECH 363 MECH 351 MECH 360 MECH 316 WRI 122/227 WRI 327 PHIL 331 ENGR 491 ENGR 492 ENGR 493	MECH 318	Purpose and audience (a), focus and organization (b), support & documentation (c), style & convention (d), visual comm. (where app) (e)	Lab reports	3-Years	Winter 2022	80% of students score 3 or 4 for criteria 3a-3e using scoresheet	Students scored > 90% on all criteria.	Evidence is in MMET Teams folders / SO Data Collection
	MECH 437	Purpose and audience (a), focus and organization (b), support & documentation (c), style & convention (d), visual communication (where app.) (e)	Project reports	3-Years	Winter 2022	80% of students score 3 or 4 for criteria 3a-3e using scoresheet	Students scored > 84% on all criteria.	Evidence is in MMET Teams folders / SO Data Collection
Summary of Aggregated Assessment Data (across all Criteria): The data is based on the assessment done on two different assignments in two different courses. Each Performance Indicator (Criteria) were scored / student.								
SO3 Results of Evaluation of Aggregated Assessment Data: The findings indicate the students' performance was good overall.								
SO3 Actions for Continuous Improvement: None needed.								

Table 4.3 – The B.S. in Mechanical Engineering Continuous Improvement Using Student Outcomes and Assessment Results

EAC SO 4: an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts **Seattle Campus Assessment of BSME Program for SO 4**								
Courses corresponding to the SO	Course(s) used for assessment	Performance Indicators	Assessment Method	Cycle of Assessment	Year/Semester of Assessment	Target	Results	Documents
MECH 315 MECH 316 ENGR 355 PHIL 331 SPE 111/321 WRI 327 ENGR 491 ENGR 492 ENGR 493	ENGR 355	Knowledge of ethics, impact of engineering solutions in global, economic, environmental, and societal contexts	Write a research paper on the global, economic, environmental and social impacts of the use of CFCs	3-Years	Fall 2021	80% of students score 3 or 4 for criteria 4a-4f using scoresheet	Students scored >80% on all criteria	Evidence is in MMET Teams folders / SO Data Collection
Summary of Aggregated Assessment Data (across all Criteria): The data is based on the assessment done on one assignment in ENGR 355 Thermodynamics I. This course has applications of ethical and professional responsibilities in mechanical engineering problems. The class was made up of 4 BSME students. Each Performance Indicator (Criteria) were scored / student.								
SO4 Results of Evaluation of Aggregated Assessment Data: The threshold for success is defined as 80% of students in class score a 3 or 4 on question/assignments that is selected as performance indicator. Only BSME students were included in this assessment. The findings indicate the students' performance was good overall.								

Table 5.1 – The B.S. in Mechanical Engineering Continuous Improvement Using Student Outcomes and Assessment Results

EAC SO 5: An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

Klamath Falls Campus Assessments of BSME Program for SO 5

Courses corresponding to the SO	Course(s) used for assessment	Performance Indicators	Assessment Method	Cycle of Assessment	Year/Semester of Assessment	Target	Results	Documents
ENGR 491-3 MECH 437 MECH 316 MECH 436 MECH 360 SPE 321	MECH 437	Use Heat-Sink design problem to determine team performance on group homework assignment	Students presented a team design solution for Heat Sink that covered aspects of the 5a-5h criteria for SO 5	3-Years	Fall 2021	80% of students score 3 or 4 for criteria 5a-5h using scoresheet	Students scored >80% on all criteria 5a -5h. No weaknesses identified from this assessment.	Evidence is in MMET Teams folders / SO Data Collection
	MECH 360	Team HW assignment to determine best fiber matrix for a composite material	Students presented a team design solution for developing a composite using mod. of strength / elasticity data. Crit. 5a-5h -SO 5	3-Years	Fall 2021	80% of students score 3 or 4 for criteria 5a-5h using scoresheet	Students scored 90% on all criteria 5a -5h. No weaknesses identified from this assessment.	Evidence is in MMET Teams folders / SO Data Collection

Summary of Aggregated Assessment Data (across all Criteria):
The data is based on an assessment done using assignments in two courses (MECH 437 and MECH 360). Both have opportunities to learn / demonstrate teamwork in mechanical engineering related scenarios. The classes were made of 14 BSME students in MECH 37 (Heat Transfer) and 13 students in MECH 360 (Materials II). All Performance Indicators were scored for each student.

SO5 Results of Evaluation of Aggregated Assessment Data:
The threshold for success is defined as 80% of students in class score a 3 or 4 on question/assignments that is selected as performance indicator. Only BSME students were included in this assessment. The findings indicate the students' performance was very good overall, with both groups meeting the 80% threshold, no further action is required for this SO at this time. Students were able to utilize the information given in different appendices and compile the data to determine the best fiber matrix combination for a composite with required strength and elastic modulus.

SO5 Actions for Continuous Improvement:
Perhaps a predefined format (either from industry practices) or a simplified version of in class activities could be more helpful. Students were able to adapt and utilize a set framework rather than coming up with an innovative idea of their own.

SO5 Results of Actions for Improvement:
No closing-the-loop actions were required based on the results of the assessment. Faculty mentioned in the MECH 36 class that "Delivery and sharing of data could have been improved. Some students fell short of including a supplementary information that could have been useful to facilitate a better teamwork, and communication style.

SO5 Assessment Instruments:
Regarding SO5 assessment in MECH 437, a team assignment was used related to the design of a heat sink. This problem is relevant to the mechanical engineering field of study. The SO5 assessment in MECH 360, an assignment to determine the optimal fiber matrix for developing a composite material was used.

Table 5.2: The B.S. in Mechanical Engineering Continuous Improvement Using Student Outcomes and Assessment Results

EAC SO 5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives **PM Campus Assessment of BSME Program for SO 5**								
Courses corresponding to the SO	Course(s) used for assessment	Performance Indicators	Assessment Method	Cycle of Assessment	Year/Semester of Assessment	Target	Results	Documents
MECH 260 MECH 318 MECH 363 MECH 480 MECH 436 MECH 316 MECH 437 SP 321 ENGR 491 ENGR 492 ENGR 493	MECH 260		Lab reports	3-Years	Fall 2021	80% of students score 3 or 4 for criteria 5a-5h using scoresheet	Students scored >83% on all criteria	Evidence is in MMET Teams folders / SO Data Collection
Summary of Aggregated Assessment Data (across all Criteria): The faculty assessed this outcome in MECH 260 Fall term 2021, using a report. There were a total of 12 students in the class (10 mechanical engineering). Only the mechanical engineering students were considered.								
SO5 Results of Evaluation of Aggregated Assessment Data: The findings indicate the students' performance was good overall.								
SO5 Actions for Continuous Improvement: Not needed.								

Table 5.3 – The B.S. in Mechanical Engineering Continuous Improvement Using Student Outcomes and Assessment Results

EAC SO 5: an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives **Seattle Campus Assessment of BSME Program for SO 5**								
Courses corresponding to the SO	Course(s) used for assessment	Performance Indicators	Assessment Method	Cycle of Assessment	Year/Semester of Assessment	Target	Results	Documents
MECH 260 MECH 318 MECH 363 MECH 480 MECH 436 MECH 316 MECH 437 SP 321 ENGR 491 ENGR 492 ENGR 493	MECH 318		Laboratory Exercise on Archimedes' Principle	3-Years	Fall 2021	80% of students score 3 or 4 for criteria 5a-5h using scoresheet	Students scored >85% on all criteria	Evidence is in MMET Teams folders / SO Data Collection
Summary of Aggregated Assessment Data (across all Criteria): The data is based on the assessment done on one assignment in MECH 318 Fluid Mechanics I. This course has applications of teamwork during laboratory sessions. The class was made up of 7 BSME students. Each Performance Indicator (Criteria) were scored / student.								
SO5 Results of Evaluation of Aggregated Assessment Data: The threshold for success is defined as 80% of students in class score a 3 or 4 on question/assignments that is selected as performance indicator. Only BSME students were included in this assessment. The findings indicate the students' performance was good overall.								
SO5 Actions for Continuous Improvement: Not needed.								

7. Data-driven Action Plans: Changes Resulting from Assessment

The BSME Task Force was able to formalize the Data Analysis, Closing-The-Loop (CLT), and Continuous Improvement (CI) processes for the department which will ensure that we improve our processes. We realized that the BSME faculty had been too focused on collecting the data, and we fell short of providing evidence of how that data would be used to improve teaching and student performance in the areas covered by the ABET SOs. Our work with faculty on developing corrective actions once under performance had been identified through our scoresheets really helped faculty understand the CLT objectives and how re-assessing/scoring would lead to the evidence we needed of CI for the BSME program. Some important changes moving forward will help our department stay on track and apply the assessment system as it is intended to be used:

- Transition to a 2-year cycle for data collection, using years 3 & 6 for CLT and CI.
- A focused and group effort to process the data and analyze it for CLT discussions.
- More consistency and standardization in which classes are used for SO data collection.
- Collecting data from the same classes for SOs at all 3 campuses where BSME offered.
- Use data and CLT cases to look at similarities and differences among students/teachers.
- Utilize Site Leaders (faculty) to process and organize data and lead CLT/CI discussions.

8. Closing the Loop: Evidence of Improvement in Student Learning

Our dedicated efforts to close the loop on student outcomes have significantly enhanced the effectiveness of our Mechanical Engineering program. By systematically assessing and refining these outcomes, we have ensured that our students are very capable of identifying, formulating, and solving complex engineering problems and producing designs that demonstrate the use of constraints and other factors. These improvements underscore our commitment to continuous improvement, resulting in a curriculum that meets ABET standards. This process guarantees that our graduates are well-prepared to succeed in their careers, equipped with the critical thinking, problem-solving, and design know-how necessary for success as mechanical engineering professionals.

By consistently aligning our coursework with industry-recognized benchmarks, we ensure that our students are not only well-versed in theoretical concepts but also proficient in applying these principles to real-world scenarios. This strategic focus equips our graduates with the essential skills and professional acumen needed to excel in the engineering field, fostering a deep sense of ethical and professional responsibility. Our commitment to upholding these standards reinforces our program's reputation for excellence, continuously preparing students to meet and exceed the dynamic demands of the engineering industry and continue our strong reputation in education.