Mechanical Engineering Technology
2011-12 Assessment Report

I. Introduction
The Bachelor of Science program in Mechanical Engineering Technology is offered in three locations—Klamath Falls, Portland Metro Center, and at the Seattle campus located at Boeing. In Klamath Falls and Seattle the entire program is offered; the Portland campus offers a degree-completion program (i.e. only Junior and Senior courses are offered, the lower-division courses are expected to be taken at a community college). During the years 2004-2009, overall enrollment ranged from 145 to 120, with a high during 2005 of 147 students. Fall term 2011 enrollment was 101 full and part-time students. During the 2010-11 year, the program graduated a total of 18 students. Of the seven 2011graduates responding, an average salary of $61,900 was reported.

The Mechanical Engineering Technology (MET) Program at Oregon Institute of Technology (OIT) was first accredited by ABET in 1970. There have been no major program changes since the last ABET visit in fall 2008. Based on recommendations from the MMET Industry Advisory Council, curricular changes have been made in the past three years to keep the program current: board drafting has been replaced with CAD and sketching has been included in the orientation class and elective courses have been added to provide exposure to new technologies related to lean manufacturing, composites and alternative forms of energy such as wave energy.

However, the Manufacturing and Mechanical Engineering and Technology (MMET) Department in which the MET Program resides has experienced numerous changes and upgrades over the past six years. The first major change was the merger of the Manufacturing Engineering Technology Department with the Mechanical Engineering Technology Department in 2004. This was done to increase administrative efficiency. The result was a stronger program with more resources available and better faculty collaboration. The second major change was the addition of a Bachelor of Science in Mechanical Engineering Degree Program; with the first students graduating in 2007. The Fall 2010 visit from the ABET review committee for Mechanical Engineering was very positive and moved the program toward full accreditation. The result has been a stronger program with more resources available and better faculty collaboration.

II. Program Mission, Objectives and Student Learning Outcomes
Following a fall 2008 ABET visit, the faculty revisited the program educational objectives and revised them. These were reviewed and approved by the faculty and the program's industrial advisory council in fall 2009. The new objectives are listed below. The faculty reviewed and reaffirmed the mission, program educational objectives and student learning outcomes in the fall 2011 assessment meeting.

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

Program Educational Objectives
Program educational objectives (PEO's) are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve. The Program Educational Objectives of OIT's mechanical engineering technology program are established to produce graduates who:

- are able to analyze and design practical mechanical systems.
- communicate effectively and work well on team-based engineering projects.
- succeed in entry-level mechanical and manufacturing engineering positions.
- pursue continued professional development.

The faculty planned an assessment cycle for the program's educational objectives as shown in Table 1 below.

Program Objective Assessment Cycle	2010-11	2011-12	2012-13
Review Program Mission and Educational Objectives by the industrial advisory committee		x	
Assess Program Educational Objectives			x

Table 1. Program Education Objectives Assessment Cycle

The MMET Industrial Advisory Committee reviewed the program mission and educational objectives on April 20, 2012. The committee made recommendations to modify the third program educational objective to read "succeed in mechanical and manufacturing engineering careers."

Student Learning Outcomes

The Mechanical Engineering Technology Program outcomes have been mapped to the ABET a-k outcomes, located in Appendix A. Within this report outcomes will be referenced by the ABET a-k nomenclature. These are listed below for reference. An engineering technology program must demonstrate that graduates have:

a. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines
b. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology
c. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes
d. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives
e. An ability to function effectively on teams
f. An ability to identify, analyze and solve technical problems
g. An ability to communicate effectively
h. A recognition of the need for, and an ability to engage in lifelong learning
i. An ability to understand professional, ethical and social responsibilities
j. A respect for diversity and a knowledge of contemporary professional, societal and global issues
k. A commitment to quality, timeliness, and continuous improvement.

In addition to the eleven a-k outcomes, there is an additional outcome identified through the ABET Mechanical Engineering specific criteria. This outcome is shown below.

MET a: Baccalaureate degree programs must demonstrate that graduates can apply specific program principles to the analysis, design, development, implementation, or oversight of more advanced mechanical systems or processes depending on program orientation and the needs of their constituents.

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

The faculty planned a three-year assessment cycle for the program's student learning outcomes as shown in Table 2 below.

Student Learning Outcome	2011-12	2012-13	2013-14
a. An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines			x
b. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology	x		
c. An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes			x
d. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives	x		
e. An ability to function effectively on teams		x	
f. An ability to identify, analyze and solve technical problems	x		
g. An ability to communicate effectively			x
h. A recognition of the need for, and an ability to engage in lifelong learning			x
i. An ability to understand professional, ethical and social responsibilities		x	
j. A respect for diversity and a knowledge of contemporary professional, societal and global issues		x	
k. A commitment to quality, timeliness, and continuous improvement		x	
Met a. Baccalaureate degree programs must demonstrate that graduates can apply specific program principles to the analysis, design, development, implementation, or oversight of more advanced mechanical systems or processes depending on program orientation and the needs of their constituents.	x		

Table 2. Assessment Cycle

IV. Summary of 2011-12 Assessment Activities

The Mechanical Engineering Technology faculty conducted formal assessment of four student learning outcomes during the 2011-12 academic year. These five outcomes have been mapped to the curriculum as shown in Appendix A. The four SLO's are: b) An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology, d) An ability to apply creativity in the design of systems, components or processes appropriate to program objectives, e) An ability to function effectively on teams, f) An ability to identify, analyze and solve technical problems and MET a: Baccalaureate degree programs must demonstrate that graduates can apply specific program principles to the analysis, design, development, implementation, or oversight of more advanced mechanical systems or processes depending on program orientation and the needs of their constituents.

SLO b. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.

The performance criteria for this learning outcome are:

1. Apply math principles to obtain analytical or numerical solution(s) to an engineering problem.
2. Apply scientific principles that govern the performance of a given process or system in engineering problem(s).
3. Apply engineering principles that govern the performance of a given process or system in engineering problem(s).
4. Apply appropriate technology for a given process or system to an engineering problem.

Direct Assessment #1 Klamath Campus
The faculty assessed this outcome in MET 360 Materials II fall term 2011, using a exam scored with a rubric. This assessment was administered to students from all majors in the MMET Department. There were seven mechanical engineering technology (MET), four manufacturing and three mechanical engineering students involved in the assessment. The MET students and combined results for all 14 students are shown in Table 3 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MET Results	MMET Results
Applies math principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	100%	100%
Applies scientific principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	85.7%	85.7%
Applies engineering principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	85.7%	85.7%
Applies appropriate technology	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	71.4%	85.7%

Table 3. Assessment Results for SLO b, fall 2011, Klamath Campus

Strengths: Students seem to have the background principles and exhibit the ability to apply this knowledge. The assessment activity seemed to be a good fit in this course and an accurate assessment of students' knowledge and ability.

Weaknesses: No real apparent weaknesses. The 71.4% in the area of applying the appropriate technology is slightly low and should be reviewed in the next cycle to see if it is a weakness.

Actions: Review in next cycle to determine if there is a repeated deficiency in this area.

Direct Assessment #2 Portland Campus
The faculty assessed this outcome in MET 313 Applied Thermodynamics in the winter term 2012, using an assignment with a rubric. There were seven Mechanical Engineering Technology (MET) students involved in the assessment. The MET student's results are shown below in Table 4.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MET Results
Applies math principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	100% 6/7 -4
Applies scientific principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	100% 5/7 -4
Applies engineering principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	100% 5/7 -4
Applies appropriate technology	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	100% 5/7 -4

Table 4. Assessment Results for SLO b, spring 2012, Portland Campus

Strengths: All students scored well on applied thermodynamics homework problem. The highest scores were obtained in the application of math tools to solve the problem.

Weaknesses: None observed

Action: None required

Direct Assessment #3 Portland Campus
The faculty assessed this outcome in MET 360 Materials II spring term 2012, using a take home exam and a homework set scored with a rubric. This assessment was administered to students from all majors in the MMET Department. There were fifteen mechanical engineering technology (MET) students and two manufacturing involved in the assessment. The combined results are shown in Table 5 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MMET Results
Applies math principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	94.1%
Applies scientific principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	100%
Applies engineering principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	94.1%
Applies appropriate technology	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	100%

Table 5. Assessment Results for SLO b, spring 2012, Portland Campus

Strengths: Sixteen of the seventeen students showed competency in each of the four performance criteria.

Weaknesses: No weaknesses evident from this assessment.

Action: None required at this time.

Direct Assessment #4 Seattle Campus
The faculty assessed this outcome in ENGT 230 Statics fall term 2011, using an exam scored with a rubric. There were 8 Mechanical Engineering Technology (MET) and five Manufacturing students who participated in the assessment. The results are shown in Table 6 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	Results
Applies math principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	80%
Applies scientific principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	80%
Applies engineering principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	80%
Applies appropriate technology	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	80%

Table 6. Assessment Results for SLO b, fall 2011, Seattle Campus

Strengths: Students met faculty expectations for each performance criteria.

Weaknesses: No weaknesses noted.

Action: None required.

Indirect Assessment #1 MMET Undergraduate Exit Survey
During the spring term, each graduating senior completes an exit survey. The survey includes questions on how well the program prepared the student on each SLO. This survey data is reviewed by faculty to determine any strengths or weaknesses as perceived by students on this SLO. 15 seniors in Mechanical Engineering Technology (MET) responded to the survey, representing all sites. For SLO b, 33.3% indicated that they were highly prepared and 66.7% indicated that they were prepared on this learning outcome.

SLO d. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.

The performance criteria for this learning outcome are
1. Identify an appropriate set of realistic constraints and performance criteria.
2. Generate one or more creative solutions to meet the criteria and constraints.
3. Create a detailed design within realistic constraints.
4. Plan and manage a small technical project.

Direct Assessment #1 Klamath Campus
The faculty assessed this outcome in MET 415 Junior Design Project during spring term 2012, using a project scored with a rubric. This assessment was administered only to students from MET within the MMET Department. There were six mechanical engineering technology (MET) students involved in the assessment. The results for the students are shown in Table 7 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MET Results
Identify constraints & criteria	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	83.3%
Generate solutions	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	83.3%
Create a design	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Plan and manage a project	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	66%

Table 7. Assessment Results for SLO d, spring 2012, Klamath Campus

Strengths: This project very good at giving the students exposure to a large project and also very good at getting them to understand and supply a complete engineering drawing package. This is a new skill at this stage of the curriculum requiring them to bring many skills together in one project. Students performed well in identifying constraints and criteria, generating solutions and creating a design.

Weaknesses: Faculty observed that some students were able to master segments of the project but were unsuccessful in pulling all the pieces of the project together. Although originally designed for juniors, the majority of the students are seniors and the majority are also doing their senior project. Faculty believe performance would improve if students planned their time better. Projects are often done in a short amount of time at the end of the term without leaving time for testing, improvement, completeness.

Actions: Explore options to provide students with a stronger background in project management. It would be best for students to acquire this knowledge/skill by fall of junior year. Fall term 2012 prepare any necessary paperwork for CPC.

Direct Assessment #2 Klamath Campus
The faculty assessed this outcome in MET 492 Senior Projects spring 2011, using senior projects scored with a rubric. This assessment was administered to students from all majors in the MMET Department. There were 9 mechanical engineering technology students, 6 manufacturing and 12 mechanical engineering students, involved in the assessment. The students were divided into project teams, comprised of students from each major. The combined results are shown in Table 8 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MMET Results
Identify constraints & criteria	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Generate solutions	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Create a design	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Plan and manage a project	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%

Table 8. Assessment Results for SLO d, spring 2011, Klamath Campus

Strengths: Faculty report that all students involved in senior projects demonstrated solid design skills. Each project involved several phases: design proposal, design planning, full CAD drawing package and bill of materials, manufacturing, testing and analysis of the project, and final report out.

Weaknesses: No weakness related to this outcome. Faculty feel that the three term senior project model and design phases work well in support of this outcome.

Actions: No actions recommended.

Direct Assessment #3 Portland Campus
The faculty assessed this outcome in MET 415 Design Project were collected in fall term 2011, using a project scored with a rubric. This assessment was administered to students from only the MET program in the MMET Department. There were eleven mechanical engineering technology (MET) students involved in the assessment. The results for the students are shown in Table 9 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MET Results
Identify constraints & criteria	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Generate solutions	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	92%
Create a design	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	82%
Plan and manage a project	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%

Table 9. Assessment Results for SLO d, winter 2012, Portland Campus

Strengths: Since most students in the Portland MET program are working full time, it would make sense that they have a strong background in identifying a problem, generating solutions and managing a project. They fell slightly below the other areas in creating a design which may reflect their experience with using CAD systems and considering the realistic constraints associated with the design details and analysis.

Weaknesses: None noted

Actions: None recommended

Direct Assessment #4 Seattle Campus
Data was not collected this year but will be collected next year if possible.

Indirect Assessment #1 MMET Undergraduate Exit Survey
During the spring term, each graduating senior completes an exit survey. The survey includes questions on how well the program prepared the student on each SLO. This survey data is reviewed by faculty to determine any strengths or weaknesses as perceived by students on this SLO. 15 seniors in Mechanical Engineering Technology (MET) responded to the survey, representing all sites. For SLO d, 66.7% indicated that they were highly prepared and 33.3% indicated that they were prepared on this learning outcome.

SLO f. An ability to identify, analyze and solve technical problems

The performance criteria for this learning outcome are
1. Identify an engineering problem.
2. Make appropriate assumptions.
3. Formulate a plan which will lead to a solution.
4. Apply engineering principles to analyze the problem.
5. Document results in an appropriate format.

Direct Assessment #1 Klamath Campus
The faculty assessed this outcome in MET 426, Fluid Power Systems in winter term 2012, using an assignment scored with a rubric. There were six mechanical engineering technology (MET) students, the results for all 6 students are shown in Table 10 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MET Results
Identify an engineering problem	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Appropriate assumptions	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Formulate a plan	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Apply engineering principles	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Document results	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	86%

Table 10. Assessment Results for SLO f, spring 2012, Klamath Campus

Strengths: Every one of the students performed at or above the minimum acceptable

Weaknesses: None noted

Actions: None

Direct Assessment #2 Klamath Campus
The faculty assessed this outcome in MFG 313 Manufacturing Analysis and Planning fall term 2011, using a project scored with a rubric. This assessment was administered to students from all majors in the MMET Department. There were three Mechanical Engineering Technology (MET) students and nine manufacturing students involved in the assessment. The results of the manufacturing students are shown in Table 11 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MET Results
Identify an engineering problem	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	88.9%
Appropriate assumptions	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	88.9%
Formulate a plan	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	100%
Apply engineering principles	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	88.9%
Document results	Rubric-scored exam questions	1-4 proficiency scale	80% score 3 or 4	88.9%

Table 11. Assessment Results for SLO f, fall 2011, Klamath Campus

Strengths: Faculty observe that the mechanical engineering technology students are very skilled in identifying, analyzing and solving technical problems.

Weaknesses: No apparent weaknesses.

Actions: None recommended.

Direct Assessment #3 Portland Campus
The faculty assessed this outcome in MFG 331 Industrial Controls winter term 2012, using a project scored with a rubric. This assessment was administered to students from all majors in the MMET Department. There were ten Mechanical Engineering Technology (MET) students involved in the assessment. The results for the students are shown in Table 12 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MMET Results
Identify an engineering problem	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	72.7%
Appropriate assumptions	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	72.7%
Formulate a plan	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	63.6%
Apply engineering principles	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	72.7%
Document results	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	90.9%

Table 12. Assessment Results for SLO f, winter 2012, Portland Campus

Strengths: On review of the results faculty noted students are strong in their ability to document results.

Weaknesses: While identifying a problem, making appropriate assumptions and applying engineering principles are lower that faculty would like, student performance on these three criteria is close to expectations. The results point to a weakness in students' ability to formulate a plan. In reflecting on these results the faculty suggest that it is difficult to both teach and assess project planning in a ten week course. A pre-requisite course where project planning and management is taught would improve student's performance on this criterion.

Actions: Explore options to provide students with a stronger background in project management. It would be best for students to acquire this knowledge/skill by fall of junior year. Fall term 2012 prepare any necessary paperwork for CPC.

Direct Assessment #4 Seattle Campus
Data was not collected for this assessment

Indirect Assessment #1 MMET Undergraduate Exit Survey
During the spring term, each graduating senior completes an exit survey. The survey includes questions on how well the program prepared the student on each SLO. This survey data is reviewed by faculty to determine any strengths or weaknesses as perceived by students on this SLO. 10 seniors in Mechanical Engineering Technology (MET) responded to the survey, representing all sites. For SLO f, 83.3% indicated that they were highly prepared and 16.7% indicated that they were prepared on this learning outcome.

Met a. Baccalaureate degree programs must demonstrate that graduates can apply specific program principles to the analysis, design, development, implementation, or oversight of more advanced mechanical systems or processes depending on program orientation and the needs of their constituents.

The performance criteria for this learning outcome are

1. Identify an appropriate set of realistic constraints and performance criteria.
2. Generate one or more creative solutions to meet the criteria and constraints.
3. Create a detailed design within realistic constraints.
4. Plan and manage a small technical project.

Direct Assessment #1 Klamath Campus
The faculty assessed this outcome in MET 415 Design Project in spring term 2012, using a project scored with a rubric. This assessment was administered to students from only the MET program. There were six mechanical engineering technology (MET) students involved in the assessment. The MET results for all students are shown in Table 13 below. A new rubric was developed, see Table 14.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MET Results
Analyzes advanced mechanical systems	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Designs an advanced mechanical system	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	83%
Develops an advanced mechanical system	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	83%
Implements and oversees an advanced mechanical system	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	66.7%

Table 13. Assessment Results for SLO meta, spring 2012, Klamath Campus

Strengths: Faculty report that all students involved in MET 415 demonstrated good design and fabrication skills. Each project involved several phases: design proposal, design planning, 3D and 2D drawings and a bill of materials, manufacturing, procurement of components and materials and machining/welding skills.

Weaknesses: Projects were slow in developing and showed some lack of planning and sticking to a timeline for deliverables and completing the project in phases. Without planning, the final results did not always meet expectations and function as originally thought. It was hard for students to leave enough time to complete changes and improvement in an iterative way due to a lack of time at the end.

Actions: Better skills related to process planning. MET 415 should be completed during the junior year and/or be changed for a project planning and management class without doing a major project. Program coordinators will make MGT 345 or an ENGR course required for MET students through CPC.

Performance Criteria	(1) Limited or No Proficiency	(2) Some Proficiency	(3) Proficiency	(4) High Proficiency
Analyzes advanced mechanical systems	Poor / no assessment of criteria and objectives in identifying the needs and functionality of the proposed system	Adequate but incomplete ID of the needs and criteria while analyzing a mechanical system	Good assessment skills, analysis and organization in identifying the needs for a mechanical system.	Clear and complete ID of functional goals & objectives of a mechanical system, including documentation.
Designs an advanced mechanical system	Missing significant specifications and details resulting in low technical complexity for course level.	Covers some but not all specifications and details for design of mechanical system.	Covers nearly all specifications and details necessary for the design of mechanical system.	High level of specifications and detail that results in an efficient design. Exceeds typical technical complexity for course level
Develops an advanced mechanical system	Inadequate application of resources and missed significant milestones or system not completed.	Adequate application of resources to reach milestones and system almost completed but lacks documentation.	Good use of resources to reach milestones using an organized and documented process for system development	Excellent use of resources and planned timeline for tasks. Meets deadlines and demonstrates creativity and skills to meet expectations.
Implements and oversees an advanced mechanical system	Failed to meet criteria established in earlier steps and does not complete or implement designed system.	Partially meets criteria established for project and was able to implement and partially test designed system.	Meets criteria established for project and was able to implement and test designed system.	Demonstrated very good engineering and organizational skills in overseeing the implementation of system

Table 14. New rubric for SLO meta, spring 2012, Klamath Campus

Direct Assessment #2 Portland Campus
The faculty assessed this outcome in MET 415 Design Project in fall term 2011, using a project scored with a rubric. This assessment was administered to students from only the MET program. There were eleven mechanical engineering technology (MET) students involved in the assessment. The MET results for all students are shown in Table 15 below.

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MET Results
Analyzes advanced mechanical systems	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	100%
Designs an advanced mechanical system	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	82%
Develops an advanced mechanical system	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	91%
Implements and oversees an advanced mechanical system	Rubric-scored project	1-4 proficiency scale	80% score 3 or 4	91%

Table 15. Assessment Results for SLO M1, spring 2012, Portland Campus

Strengths: The results show that all students did well on this assessment in regards to understanding and analyzing an existing mechanical system and just slightly less proficient at designing, developing and implementing a system that they had to do themselves. The Portland students tend to do well on these assignments in part because many of them are working on engineering projects in industry.

Weaknesses: The faculty applying the assessment activity noted that as SLO METa is closely related to project management, there is a need for better planning and oversight skills. This is something that has been discussed previously and a Project Management course is being considered to improve these areas.

Actions: Discuss further action at convocation with all 3 campuses to decide how to include a 3 credit Project Management course for both MET and Mfg students.

Direct Assessment #5 Seattle Campus
No data was collected for this assessment

Indirect Assessment #1 MMET Undergraduate Exit Survey
During the spring term, each graduating senior completes an exit survey. The survey includes questions on how well the program prepared the student on each SLO. This survey data is reviewed by faculty to determine any strengths or weaknesses as perceived by students on this SLO. Fourteen seniors in MET responded to the survey, representing all sites. For SLO b, 50% indicated that they were highly prepared and 50% indicated that they were prepared on this learning outcome.

V. Summary of Student Learning for 2011-12

MMET faculty from all 3 sites met on May 29, 2012 and again during convocation on Sept. 18th to review assessment results, to determine if improvements were needed, and to decide upon future action plans. A summary of their findings is outlined below.

SLO b. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.

Strengths: Students seem to have the background principles and exhibit the ability to apply knowledge of math, science, engineering and technology.
Weaknesses: No weaknesses noted.
Actions: No action required.

SLO d. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.

Strengths: Students performed well in identifying constraints and criteria, and generating solutions.
Weaknesses: Faculty observed that plan and manage a project is an area of weakness which shows up in various assessments.
Actions: Discuss change to curriculum so that Project Planning can be emphasized in MET curriculum

SLO f. An ability to identify, analyze and solve technical problems

Strengths: Students have the fundamental principles and experience, and exhibit the ability identify, analyze and solve technical problems.
Weaknesses: No weaknesses noted.
Actions: No action required.

SLO Met a. Baccalaureate degree programs must demonstrate that graduates can apply specific program principles to the analysis, design, development, implementation, or oversight of more advanced mechanical systems or processes depending on program orientation and the needs of their constituents.

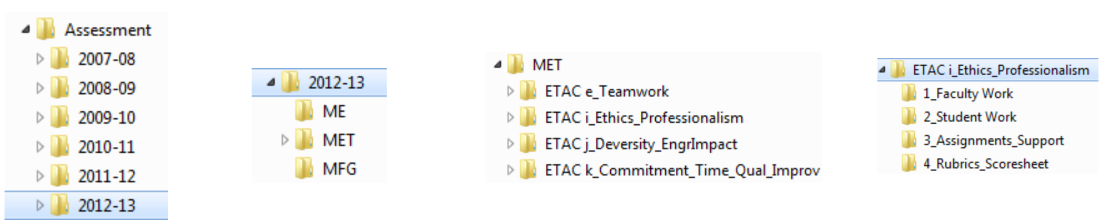
Strengths: Students have gained valuable skills and experience at designing and fabricating components and assemblies by the time they take the 400 level project courses. They are resourceful and are able to order materials and follow procedures to gather the resources and materials to complete the project.
Weaknesses: Planning, managing work, defining roles
Actions: Make the MET 415 class an enforced pre-requisite for Senior Project and look into making a project management course a requirement for students during their junior year.

Summary of Recommendations for MET Program:

1) Complete paperwork for CPC to drop MET 415 and add in MGT 445 or ENGR 445. These classes will cover Project Management and be taught be professors in the Management Department at the Oregon Institute of Technology at all 3 campuses.
2) Complete CPC paperwork to change catalog so that MET students are required to take the Fundamentals Exam and not the FE or the SME Mfg Certification Exam as is currently stated.
3) Change spring term assessment policy, limiting activities as possible to collecting data for upcoming year due to the fact that the annual faculty review of SLO's can take place in June.
4) Review survey questions and add new ones as needed to assess SLO's that are covered.

General Recommendations for Assessment in 2012-2013:

The folder structure for organizing and managing data collection from the faculty and different campuses will be simplified so that there are not multiple places where rubrics, score-sheets, sample assignments and faculty/student information is located on the OIT T: drive. The score-sheet design will also be improved to encourage faculty doing the assessment activity will provide specific and qualitative feedback for inclusion in the annual report. The faculty thinks that this feedback is critical in accurately assessing the program and student performance. A preliminary design for the score-sheet, that if agreed upon by the program directors, will be applied to all score-sheets across the 3 programs (Mech, Mfg, MET) is shown in Appendix A5. An example of the folder organization is shown below:



VI. Changes Resulting from Assessment (2011-12 progress on 2010-11 planned improvements from Spring 2011 faculty meeting)

SLO e. An ability to function effectively on teams

In the 2009-10 assessment of this outcome faculty noted a weakness with student teams not sharing work appropriately and failing to develop effective strategies if they have an ineffective student leader. The faculty decided to approach these issues by increasing instruction in the area of project planning and management, in order to provide students with an increased skill set for working effectively in teams. This area of instruction has recently been added to MET 111-112, Orientation, and will also be emphasized in upper-division courses.

Though the added emphasis in MET 111-112 was implemented three years ago, faculty report no improvement at the senior project level. The faculty recommends implementing a project planning and management elective in the curriculum. This recommendation also is in alignment with recommendations from the industry advisory council.

SLO g. An ability to communicate effectively.
Recommend faculty review the OIT public speaking rubric and prior oral presentation knowledge with students while preparing for technical presentations.

Portland: Review the curriculum map identifying courses where students can gain more experience doing oral presentations.

SLO i. An ability to understand professional, ethical and social responsibilities.

This outcome was assessed in 2009-10 showing a weakness in the areas of student ability to describe parties involved and points of view, analyzing possible alternative approaches, and supporting an approach with benefits and risks. The faculty recommended increased student exposure to analyzing ethics scenarios in MET 111-112, Orientation, through course assignments and the use of the OIT ethics rubric in these courses. These actions have been implemented and data was collected in MET 111 fall 2011.

The methodology used in creating the assignment was based on preparing students ahead of time using the rubric and guidelines for completing the assignment. The wording of the assignment was as follows:

2 page report summarizing the main points presented in the case and then relates the study to a personal experience or thoughts that you have in how this case relates to the responsibilities and accountability of professional engineers and students in engineering. You should also be prepared to share your thoughts with fellow students in a discussion of this and other topics related to professional ethics and the NSPE Code of Ethics for Engineers that is presented in Appendix B of your course textbook "Engineering Fundamentals and Problem Solving.

Web Sites Used for Case Studies:
http://csciwww.etsu.edu/gotterbarn/cases.htm
http://www.niee.org/cases/
http://www.engsc.ac.uk/er/ethics/ethicscases.asp

Performance Criteria	Assessment Method	Measurement Scale	Minimum Acceptable Performance	MMET Results
1. Using code of ethics, describes ethical issue(s)	Rubric-scored Assignment / Case Study	1-4 proficiency scale	80% score 3 or 4	100% 15-3 15-4
2. Describes parties involved and discusses their points of view.	Rubric-scored Assignment / Case Study	1-4 proficiency scale	80% score 3 or 4	100% 19-3 11-4
3. Describes and analyzes possible/ alternative approaches	Rubric-scored Assignment / Case Study	1-4 proficiency scale	80% score 3 or 4	100% 30-3
4. Chooses an approach and explains the benefits and risks.	Rubric-scored Assignment / Case Study	1-4 proficiency scale	80% score 3 or 4	28% 3-4 5-3 22-2

The results show that although students understood the issues and the relevance of ethics and professionalism as it relates to engineering, as freshmen they do not have enough experience or references in their personal lives to identify and evaluate the implications of the alternative approaches to confront some of these issues. Their strengths are in the area of understanding what the engineering code of ethics is and why it is important. They are weaker at the analysis of approaches and implications related to these scenarios. It would be a good idea to continue to assess this exercise on a regular cycle in the Freshmen Orientation class and try to incorporate more material and real world examples of engineering ethics along with the outcomes and approaches that were taken in each case.

Appendix A1
SLO-Curriculum Map

Outcome b: An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.

I = Introduced R = Reinforced E = Emphasized

	Freshman			Sophomore			Junior			Senior		
Fall	Math 111	Coll Algebra		MATH 252	Integral Calc		ENGR 236	Elect Circuits		MET 323	Heat Transfer	R
	MET 111	Orient I	I	MET 160	Materials I	R	ENGR 266	Comp Program		MET 326	EPS	
	WRI 121	Eng Comp		PHY 201/221	Physics		MET 315	Machine Design I	R	IMGT 345	Engineer Economy	
	CHE 101	Chem		WRI 227	Tech Report		MET 360	Materials II	E	MET 490	Senior Proj I	R
	CHE 104	Chem Lab		MET 241	CAD I	R	MET 363	Instrum	R	WRI 321	Adv Tech Wr	
		Psy Elective									MET Elective	
Win	Math 112	Trig		ENGR 211	Statics		ENGR 212	Dynamics		MET 426	FPS	
	MET 112	Orient II	I	Math 254N	Vector Calc I		ENGR 355	Thermo	I	MET 437	Heat Tran Lab	R
	MFG 103	Welding		MET 242	CAD II		MET 316	Machine Design II	R	MET 491	Senior Proj II	R
	WRI 122	Eng Comp		MFG 112	Intro Mfg Proc	I	MET 375	Solid Modelling		SPE 321	Small Group	
		Soc Sci Elevtive		PHY 202/222	Physics			Soc Sci Elective		WRI 322	Adv Tech Wr	
											MET Elective	
Spr	Math 251	Diff Calc		ENGR 213	Strengths		MET 313	Applied Thermo	E	MET 492	Senior Proj III	R
	MFG 120	Mfg Proc I	I	Math 361	Stats I		MET 415	Design Project		MFG 331	Indust Controls	
	SPE 111	Speech		MET 218	Fluids	R	MET 351	FEA		WRI 323	Adv Tech Wr	
		Econ Elective		PHY 203/223	Physics		MFG 314	GDT			Engineer Exam	
		Hum Elective						Hum Elective			Hum Elective	
											MET Elective	
											MET Elective	

Appendix A2
SLO-Curriculum Map

Outcome d: An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.

I = Introduced R = Reinforced E = Emphasized

	Freshman			Sophomore			Junior			Senior		
Fall	Math 111	Coll Algebra		MATH 252	Integral Calc		ENGR 236	Elect Circuits		MET 323	Heat Transfer	
	MET 111	Orient I	I	MET 160	Materials I		ENGR 266	Comp Program		MET 326	EPS	
	WRI 121	Eng Comp		PHY 201/221	Physics		MET 315	Machine Design I	R	IMGT 345	Engineer Economy	
	CHE 101	Chem		WRI 227	Tech Report		MET 360	Materials II		MET 490	Senior Proj I	E
	CHE 104	Chem Lab		MET 241	CAD I	R	MET 363	Instrum		WRI 321	Adv Tech Wr	
		Psy Elective									MET Elective	
Win	Math 112	Trig		ENGR 211	Statics		ENGR 212	Dynamics		MET 426	FPS	
	MET 112	Orient II	I	Math 254N	Vector Calc I		ENGR 355	Thermo		MET 437	Heat Tran Lab	
	MFG 103	Welding		MET 242	CAD II	R	MET 316	Machine Design II	E	MET 491	Senior Proj II	E
	WRI 122	Eng Comp		MFG 112	Intro Mfg Proc		MET 375	Solid Modelling	E	SPE 321	Small Group	
		Soc Sci Elevtive		PHY 202/222	Physics			Soc Sci Elective		WRI 322	Adv Tech Wr	
											MET Elective	
Spr	Math 251	Diff Calc		ENGR 213	Strengths		MET 313	Applied Thermo		MET 492	Senior Proj III	E
	MFG 120	Mfg Proc I	I	Math 361	Stats I		MET 415	Design Project	E	MFG 331	Indust Controls	
	SPE 111	Speech		MET 218	Fluids	R	MET 351	FEA	E	WRI 323	Adv Tech Wr	
		Econ Elective		PHY 203/223	Physics		MFG 314	GDT			Engineer Exam	
		Hum Elective						Hum Elective			Hum Elective	
											MET Elective	
											MET Elective	

Appendix A3
SLO-Curriculum Map

Outcome f: An ability to identify, analyze and solve technical problems.

I = Introduced R = Reinforced E = Emphasized

	Freshman			Sophomore			Junior			Senior		
Fall	Math 111	Coll Algebra		MATH 252	Integral Calc		ENGR 236	Elect Circuits	R	MET 323	Heat Transfer	E
	MET 111	Orient I	I	MET 160	Materials I		ENGR 266	Comp Program	R	MET 326	EPS	R
	WRI 121	Eng Comp		PHY 201/221	Physics		MET 315	Machine Design I	E	IMGT 345	Engineer Economy	
	CHE 101	Chem		WRI 227	Tech Report		MET 360	Materials II		MET 490	Senior Proj I	E
	CHE 104	Chem Lab		MET 241	CAD I		MET 363	Instrum	E	WRI 321	Adv Tech Wr	
		Psy Elective									MET Elective	
Win	Math 112	Trig		ENGR 211	Statics	R	ENGR 212	Dynamics	E	MET 426	FPS	R
	MET 112	Orient II	I	Math 254N	Vector Calc I		ENGR 355	Thermo	E	MET 437	Heat Tran Lab	E
	MFG 103	Welding		MET 242	CAD II		MET 316	Machine Design II	E	MET 491	Senior Proj II	E
	WRI 122	Eng Comp		MFG 112	Intro Mfg Proc		MET 375	Solid Modelling		SPE 321	Small Group	
		Soc Sci Elevtive		PHY 202/222	Physics			Soc Sci Elective		WRI 322	Adv Tech Wr	
											MET Elective	
Spr	Math 251	Diff Calc		ENGR 213	Strengths	R	MET 313	Applied Thermo	E	MET 492	Senior Proj III	E
	MFG 120	Mfg Proc I	I	Math 361	Stats I		MET 415	Design Project	E	MFG 331	Indust Controls	R
	SPE 111	Speech		MET 218	Fluids	R	MET 351	FEA	E	WRI 323	Adv Tech Wr	
		Econ Elective		PHY 203/223	Physics		MFG 314	GDT			Engineer Exam	
		Hum Elective						Hum Elective			Hum Elective	
											MET Elective	
											MET Elective	

Appendix A4
SLO-Curriculum Map

Outcome MET a: Baccalaureate degree programs must demonstrate that graduates can apply specific program principles to the analysis, design, development, implementation, or oversight of more advanced mechanical systems or processes depending on program orientation and the needs of their constituents.

I = Introduced R = Reinforced E = Emphasized

	Freshman			Sophomore			Junior			Senior		
Fall	Math 111	Coll Algebra		MATH 252	Integral Calc		ENGR 236	Elect Circuits		MET 323	Heat Transfer	
	MET 111	Orient I		MET 160	Materials I		ENGR 266	Comp Program		MET 326	EPS	
	WRI 121	Eng Comp		PHY 201/221	Physics		MET 315	Machine Design I	I	IMGT 345	Engineer Economy	
	CHE 101	Chem		WRI 227	Tech Report		MET 360	Materials II		MET 490	Senior Proj I	E
	CHE 104	Chem Lab		MET 241	CAD I		MET 363	Instrum		WRI 321	Adv Tech Wr	
		Psy Elective									MET Elective	
Win	Math 112	Trig		ENGR 211	Statics		ENGR 212	Dynamics		MET 426	FPS	R
	MET 112	Orient II		Math 254N	Vector Calc I		ENGR 355	Thermo		MET 437	Heat Tran Lab	R
	MFG 103	Welding		MET 242	CAD II		MET 316	Machine Design II	R	MET 491	Senior Proj II	E
	WRI 122	Eng Comp		MFG 112	Intro Mfg Proc		MET 375	Solid Modelling		SPE 321	Small Group	
		Soc Sci Elevtive		PHY 202/222	Physics			Soc Sci Elective		WRI 322	Adv Tech Wr	
											MET Elective	
Spr	Math 251	Diff Calc		ENGR 213	Strengths		MET 313	Applied Thermo		MET 492	Senior Proj III	E
	MFG 120	Mfg Proc I		Math 361	Stats I		MET 415	Design Project	E	MFG 331	Indust Controls	
	SPE 111	Speech		MET 218	Fluids	I	MET 351	FEA		WRI 323	Adv Tech Wr	
		Econ Elective		PHY 203/223	Physics		MFG 314	GDT			Engineer Exam	
		Hum Elective						Hum Elective			Hum Elective	
											MET Elective	
											MET Elective	

Appendix A5

ETAC i: OIT Ethics Assessment Score Sheet

a. An ability to understand professional, ethical and social responsibilities

Course name/number:		Oregon Institute of Technology Assessment Manufacturing and Mechanical Engineering and Technology Scoresheet applies to BSMET and BSMFGET Degree Programs
Location (KF,P,S):		
Instructor:		
Term (F,W,S):		

Instructor Comments: Please help identify strengths and weaknesses of student performance on this assignment related to the following:

1) How good are students at applying the code(s) of ethics to the scenario?

2) What was students level of comprehension related to issues and points of view described in the scenario?

3) How well did students think about and describe the alternatives that consider the interests of the parties involved?

4) Did students identify the risks and benefits clearly to choose a good alternative

				Provisions			Ethics Scenario				
Student ID	Last Name	First Name	Major of Stud	Provision 1	Provision 2	Provision 3	1. Issues	2. Parties	3. Approaches	4. Benefits/Risks	SCORE
							% 3 or 4	% 3 or 4	% 3 or 4	% 3 or 4	

Appendix A6: Letter Sent to Faculty for Collection of Assessment for MET Program:

March 18, 2012: MMET Faculty and Assessment Participants:

This is a summary of the assessment material collection and rubric/score-sheet completion activities for Mechanical Engineering Technology (MET) during the 2011-2012 Academic Year. Please review the tables for the 4 Student Learning Outcomes (SLO's) that are being evaluated this cycle and check the Student Material and Rubric/Score boxes and return it to me. Please answer Y / N / or Pending for each class/assignment. If we haven't collected material from Fall and Winter term classes as shown in the tables, we will need to collect something different in the Spring term in order to complete the Annual MET Report that is important for program .

In order to remain on schedule for the assessment of the MET program, please collect the materials, complete the rubrics/score-sheets and submit the materials as soon as it is available. Sandra Bailey and I have set up folders on the staff T: drive on the KFalls server as a convenient storage location. The path to that folder is: T:\MMET\Assessment\2011-12\MET. The rubrics for each SLO and score-sheets are also available in the same T:Drive location.

SLO b) An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology

Location, Course Used and Faculty Name	**Student Material**	**Rubric/Score**
Klamath Falls:	**Collected Y/N**	**Complete Y/N**
Joe Stuart – MET 360, Exam Question, Fall		
Moravec – MET 313, Homework Problem, Spring		
Senior Project Faculty – Sr. Projects, Senior Survey, Spring		
Portland:		
Falcon – MET 360, Exam Question, Spring		
Peters – MET 313, Homework Problem, Winter		
Peters – Senior Project, Senior Survey, Spring		
Seattle:		
Bridge/Prof – ENGT 230, Fall		
Bridge/Prof – MET360, Winter		
Bridge – Senior Project, Senior Survey, Spring		

SLO d) An ability to apply creativity in the design of systems, components or processes appropriate to program objectives

Location, Course Used and Faculty Name	**Student Material**	**Rubric/Score**
Klamath Falls:	**Collected Y/N**	**Complete Y/N**
Culler – MET 415, Project, Spring		
Moravec – MET492, Project, S11 (last year)		
Moravec – Sr. Projects, Senior Survey, Spring		
Portland:		
Wade – MET 415, Project, Fall		
Wolf – MET 492, Project, Winter		
Peters – Online Survey, Spring		
Seattle:		
Bridge/Prof – MFG343, Project, Winter		
Bridge/Prof – MFG463, Project, Spring		
Bridge – Online Survey, Spring		

SLO f) An ability to identify, analyze and solve technical problems

Location, Course Used and Faculty Name	Student Material	Rubric/Score
Klamath Falls:	**Collected Y/N**	**Complete Y/N**
Edgeman – MFG331, lab/project, Spring		
Moravec – MET 426, Assignment, Winter		
Senior Project Faculty – Online Survey, Spring		
Portland:		
Wade – MFG 331, lab/project, Winter		
Cohen – MET 426, Assignment, Spring		
Peters – Online Survey, Spring		
Seattle:		
Bridge/Proj – MFG331, Assignemnt, Winter /Spring		
Bridge/Proj – MFG313, Project, Winter		
Bridge – Online Survey, Spring		

MET a: Baccalaureate degree programs must demonstrate that graduates can apply specific program principles to the analysis, design, development, implementation, or oversight of more advanced mechanical systems or processes depending on program orientation and the needs of their constituents.

Location, Course Used and Faculty Name	Student Material	Rubric/Score
Klamath Falls:	**Collected Y/N**	**Complete Y/N**
Moravec – MET 492, Project, Spring		
Culler – MET 415, Project, Spring		
Senior Project Faculty – Online Survey, Spring		
Portland:		
Wolf – MET 492, Project, Winter		
Wade – MET 415, Project, Fall		
Peters – Online Survey, Spring		
Seattle:		
Bridge – Senior Project, Senior Survey, Spring		

Detailed Description of Performance Criteria for Student Learning Outcomes Being Assessed

SLO b. An ability to apply current knowledge and adapt to emerging applications of mathematics, science, engineering and technology.

The performance criteria for this learning outcome are:

5. Apply math principles to obtain analytical or numerical solution(s) to an engineering problem.
6. Apply scientific principles that govern the performance of a given process or system in engineering problem(s).
7. Apply engineering principles that govern the performance of a given process or system in engineering problem(s).
8. Apply appropriate technology for a given process or system to an engineering problem.

SLO d. An ability to apply creativity in the design of systems, components or processes appropriate to program objectives.

The performance criteria for this learning outcome are

5. Identify an appropriate set of realistic constraints and performance criteria.
6. Generate one or more creative solutions to meet the criteria and constraints.
7. Create a detailed design within realistic constraints.
8. Plan and manage a small technical project.

SLO f. An ability to identify, analyze and solve technical problems

The performance criteria for this learning outcome are

6. Identify an engineering problem.
7. Make appropriate assumptions.
8. Formulate a plan which will lead to a solution.
9. Apply engineering principles to analyze the problem.
10. Document results in an appropriate format.

SLO M1. Programs must demonstrate that graduates are prepared for careers centered on the manufacture of goods. In this context, 'manufacturing' is a process or procedure through which plans, materials, personnel, and equipment are transformed in some way that adds value.

The performance criteria for this learning outcome are:

1. Design and plan a manufacturing project.
2. Select materials for the product.
3. Estimate labor and equipment requirements.
4. Cost and lay out the project.
5. Cost the product.
6. Present the project for peer review.