2007-08 MANUFACTURING ENGINEERING TECHNOLOGY SUMMARY ASSESSMENT REPORT
August 4, 2008

The Manufacturing and Mechanical Engineering and Technology Department participates in a comprehensive academic assessment activity. Included is a systematic program of assessment that fits the curriculum, student body, and faculty needs. The assessment plan is woven by threads of the department's structure and academic programs, general education, and the criteria given for accrediting engineering technology programs in the Technology Accreditation Commission Accreditation Board for Engineering and Technology (TAC - ABET).

The current document summarizes the results of the 2007-2008 assessment activities. Additional information can be found in department assessment records.

MISSION STATEMENT

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

Three Primary Goals supporting this Mission

- Provide graduates the skills and knowledge necessary for immediate employment while also assuring abilities required for continued academic work.
- Enable students to be effective communicators, life- long learners, and ethical engineering technology professionals.
- Develop and maintain partnerships with public and private institutions to ensure a relevant, high quality program.

ASSESSMENT ACTIVITIES

The Manufacturing Engineering Technology Program Outcomes have been mapped to the a-k ABET Outcomes. This mapping can be reviewed in the Manufacturing Engineering Technology Program Assessment Plan. 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 are three outcomes identified through the ABET Manufacturing Engineering specific criteria for the 2007-2008 year. These have been defined as below.

a. 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.

b. Graduates must demonstrate the ability to apply the technologies of materials, manufacturing processes, tooling, automation, production operations, maintenance, quality, industrial organization and management, and statistics to the solution of manufacturing problems.
c. Graduates must demonstrate the ability to successfully complete a comprehensive design project related to the field of manufacturing.

The first version of an exit survey for the MFG Program, which specifically asks our students to rate themselves for each ABET a-k outcome (using survey monkey) was introduced late this year. Due to the lateness of the posting of the survey, there were only 3 MFG responses. Data from this limited response is included in this report. Starting this next year it will be a requirement of the MFG program to have every student complete this exit survey when they finish their senior projects (end of spring term).

OUTCOME a

An appropriate mastery of the knowledge, techniques, skills and modern tools of their disciplines

Graduates must have a fundamental knowledge of engineering technology and the underlying mathematics and science. They must also be able to apply this knowledge to real world problems. These skills are taught in required mathematics, science and core engineering courses. Please refer to the MFG Assessment Plan for specific details.

Two assessment methods have been used to evaluate student learning in these areas. First, pre-exams are given in select courses. These courses are generally the first professional courses encountered that have the math, science and core engineering technology courses as prerequisites. The pre-exams are given at the beginning of the professional course, the first week or two of the term, and are designed to test the prerequisite material needed for that course. The specific courses selected include:

MET 315 Machine Design I
MET 360 Materials II
MET 326 Electrical Power Systems
MFG 331 Industrial Controls

The pre-exams were evaluated by a committee of faculty members using rubrics. Pre-exams from Machine Design I and Electrical Power Systems have been assessed. Exams from MET 360 and MFG 331 will be collected the next time they are offered.

The pre-exam assessment showed students performing above the base 80% in all courses except for the Machine Design pre-exam. This exam tested prerequisite knowledge in statics and strength of materials. The low results may result from the particular exam given. However, reviewing the exam in detail showed a fair exam covering core elements of statics and strengths.

The results of the pre-exam testing statics and strength of materials is being shared with the instructors of those courses. It has been confirmed that the material tested is included in these courses. Assessment will be ongoing to determine why students performed so poorly with statics and strength of materials skills.

The wide variation in student performance is also a concern. It has been recommended that fewer pre-exams be given and the saved effort goes into making these exams more consistent in format and administration. This should give some indication whether the variation is due to differences in student learning or in the exams themselves.

The second assessment method is a review of Manufacturing Certification Exam results. All graduates from the MFG Program are required to sit for this exam. Besides being the best time for a graduate to take this exam, it provides the faculty with an indispensable assessment tool. For mathematics and core engineering topics this exam is most valuable. The Manufacturing Certification Exam is being required for the first time in the MFG

program this year so results will be assessed when the data is in. Finally, the results of the MFG exit survey shows that 100% of the respondents rate themselves as either prepared or highly prepared in this area.

OUTCOME b

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

Graduates must have the fundamental knowledge of engineering and the underlying mathematics and science. They must also be able to apply this knowledge to real world problems.

MMET faculty will administer pre-exams each time the first professional courses are taught. These pre-exams will evaluate the prerequisite mathematics, science and engineering knowledge for success in the MFG program. These pre-exams will be given in the following courses every time they are taught.

Pre-Exam Course	Prerequisites Checked	Rubrics*
MET 315 Machine Design I	ENGR 213 [ENGR 211, MATH 252, MATH 251]	R1,R2
MET360 Materials II	MET 160, CHE 201	R2
MFG 331 Controls & Instrumentation	ENGR 236, MET 326	R1,R2
MET 326 Electrical Power Systems	ENGR 236	R2

* Rubric R1 = Mathematics; Rubric R2 = Science & Core Engineering Technology

Exam results will be reviewed by an MMET faculty committee and shared with instructors of the prerequisite courses. These reviews will maintain the content in these prerequisite courses needed by the MFG program and help coordinate instruction of the mathematics, science and core engineering courses. They also indicate to the instructor and students what prerequisite material, if any, needs review. A report generated by the faculty committee will indicate its findings and recommendations for improvement.

Pre-exams have been given in one of the above mentioned courses during the 2007-2008 school year. Instructors giving pre-exams in their courses were responsible for compiling and administering each exam. They were told which pre-requisite material their exam would be assessing. Beyond this instruction the content and form of the exam was left up to the instructor.

Each pre-exam was evaluated using Rubrics for mathematics and for core engineering competency. The rubric scales run from 1 to 5 with 1 being lacking and 5 being exceptional. For both rubrics the base competency score was set at 3.0 or above. The results below indicate the percent of student scoring at 3 or better.

Rubric 1 MET 315 = 65%
Rubric 2 MET 315 = 65%

The reviewers noted a broad range in exam content, form and conditions. Some faculty used multiple choice exams while others favored a more open problem format. Some administered exams in class while some were take home. The complexity of the questions also varies. At least one exam was simple enough as to not evaluate the prerequisite material.

Manufacturing Certification Exam
The Manufacturing Certification Exam is being required for the first time in the MFG program this year so results will be assessed when the data is in.

Finally, the results of the MFG exit survey shows that 100% of the respondents rate themselves as either prepared or highly prepared in this area.

The committee recommends the following actions.

a. The discrepancy between pre-exams given in different courses is of concern. The difficulty and method of administration varied greatly from faculty to faculty. It is suggested that a more standard methods be implemented to make these pre-exams more consistent. It is suggested that the number of courses in which pre-exams are given be reduced and to use this savings in effort to make the exams more consistent across the remaining courses.

b. The performance in Statics and Strength of Materials material is of concern. These are two core engineering courses which are prerequisites for MET 315 Machine Design. It is recommended that the content of these courses be reviewed to verify the topics required are being taught. It is also recommended that the pre-exams be provided to the instructors of these courses to emphasize our concerns.

OUTCOME c

An ability to conduct, analyze and interpret experiments and apply experimental results to improve processes

Being able to carry out experiments and interpret the resulting data is critical to an engineering technology education. Graduates will be able to plan an experiment or test to determine or measure a given result, select and set up appropriate equipment, conduct an experiment or test, interpret the resulting data, and then use the results to improve processes.

Students are exposed to experiments and tests through extensive laboratories. In these laboratories they set up experiments, collect and interpret data. Besides basic science and core engineering courses these laboratories are found in the following courses:

MFG 314 Geometric Dimensioning and Tolerancing
MFG 331 Industrial Controls
MET 326 Electrical Power Systems

Students are also expected to select test equipment, plan and conduct experiments, collect and interpret data, and apply the experimental results to improve their process in our senior projects sequence (MFG 461, MFG 462, and MFG 463).

This year data was only collected from MET 326 Electrical Power Systems. A total of 20 different evaluations were made, and 90% of the scores were good or better (the goal was 80% good or better). This is a limited amount of data, and it is recommended that additional student work be gathered an evaluated next year.

Finally, the results of the MFG exit survey shows that 100% of the respondents rate themselves as either prepared or highly prepared in this area.

OUTCOME d

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

This is interpreted as the ability to plan and carry out an engineering project. The critical elements of an engineering project are defined as:

- Generate an appropriate set of criteria, targets to be met
- Generate one or several proposed solutions to meet the criteria
- Generate a work breakdown/task statements needed for project completion
- Generate a time line for work defined and given resources
- Apply engineering analysis and tools to accomplish the work defined
- Track or manage a project

Parts of this are taught throughout the curriculum. However the main emphasis is from project classes, MET 111/112 Orientation and MFG 461/462/463 Senior Projects. The primary assessment method is review of Senior Project work.

The primary assessment method was a review of Senior Project work. A faculty committee reviewed senior project reports and presentations. Senior Projects is a capstone sequence which allows students to apply their education to a real world problem. The committee evaluated the student's preparedness to plan, propose, and manage an engineering project.

The committee reviewed student assignments, written and oral proposals fall term, and final reports and presentations spring term. A rubric to assess planning and managing projects was used for both oral presentations and written reports. As above a base score of three was determined to be adequate with the desire that above 80% of our students attain this level.

Our evaluation of fall term senior project proposals revealed the following: The percentage of students scoring at a good or better level in their written proposals was 76%; while the score for their oral presentations was 83%. The average score was 79.5% (from a total of 60 individual evaluations). Just the oral presentations were evaluated for spring term, and only 73% were evaluated at the adequate or better level.

Finally, the results of the MFG exit survey shows that 100% of the respondents rate themselves as either prepared or highly prepared in this area.

It was thus recommended that several small design projects be placed throughout the curriculum to better prepare students for senior projects and eventual project planning and management in industry. It was decided to require students to plan and manage very small design projects in Fluid Mechanics I and Machine Design II. This will be implemented next year, at which time we will evaluate the effectiveness of this change.

OUTCOME e

An ability to function effectively on teams

It is important that graduates have the skills to succeed in a team environment and have the chance to apply these skills during their education. The major experience students have with teams is in senior projects.

This outcome was evaluated this year in MET 111 Orientation, covering 2 different evaluations and a total of 130 evaluations. For this outcome 96.9% were determined to be good or better.

The results of the MFG exit survey shows that only 33% of the respondents rate themselves as either prepared or highly prepared in this area.

It is recommended that next year this outcome should be evaluated in senior projects as well (an evaluation was performed this year, but the data has not yet been processed).

OUTCOME f

An ability to identify, analyze and solve technical problems

Three methods have been applied to evaluate this outcome First graded assignments were collected for MET 315 Machine Design I and then assessed by a faculty committee using a rubric. The results showed that 64% of the students scored at a good or better level.

The second method of assessment was an evaluation of written senior project proposals. The same rubric was used by a faculty committee as was done for collected assignments above. Evaluation was done department wide as senior projects is a mix of engineering and engineering technology students, as well as students from other departments. The assessment of reports from the Klamath Falls campus, which encompasses all MFG students, was well above the base 80% figure. It was noted by the faculty that evaluation of technical abilities was difficult

at the proposal stage. It was thought the final reports will give much better insight into student's technical abilities; but this evaluation has not been performed yet.

Finally, the results of the MFG exit survey shows that 100% of the respondents rate themselves as either prepared or highly prepared in this area.

The faculty felt that no specific action, beyond normal course improvement, was required.

OUTCOME g

An ability to communicate effectively

Effective communication is critical to a successful career in manufacturing engineering technology. Students must be able to communicate in writing, speech, and graphically. OIT's Manufacturing Engineering Technology program has a particular strength in this area. The specific skills addressed include:

1. Ability to communicate clearly and concisely in written reports
2. Ability to communicate verbally, both prepared presentations and impromptu discussions
3. Ability to communicate through drawings, both formal drawings and sketches

MFG students learn through formal writing and speech classes, extensive laboratory report writing, and through senior project reports and presentations. Drawing and CAD skills area also gained through several directed courses, specific projects in required upper division courses and orientation courses and senior projects.

Review of an assignment from MET 242 CAD for Mechanical Design II was assessed using the rubric process. It was assessed that 69% of students were performing at or above a level of three (good). Again the desired level is at 80%. There are several opportunities for students to use and improve their drawing skills between MET 242 and graduation.

The results of the MFG exit survey shows that only 33% of the respondents rate themselves as either prepared or highly prepared in this area.

The faculty recommended that laboratory writing guides and content be reviewed so that faculty teaching lab courses are giving the students a consistent format and expectations. This is planned to be implemented during the departmental retreat during fall of 2008.

The faculty also thought that the pairing of senior projects with the one credit writing courses has improved student abilities in report writing. It was recommended this pairing continue and be extended to satellite campuses.

OUTCOME h

A recognition of the need for, and an ability to engage in lifelong learning

In a rapidly changing world, particularly technological change, a commitment to life long learning is essential for a long successful career. Students come to an understanding of the need for life long learning is developed through a broad general education and an awareness of how rapidly technology is changing. Advances and history of technology are highlighted in all courses dealing with technology, particularly those involving computers and lab equipment. However, this is an accumulated learning and difficult to assign to any one or series of courses.

The results of the MFG exit survey shows that 100% of the respondents rate themselves as either prepared or highly prepared in this area. Using this limited amount of data it is hard to derive any conclusive results. It is recommended that a second evaluation method be developed to evaluate this outcome, ant that this outcome be reevaluated next year.

OUTCOME i

An ability to understand professional, ethical and social responsibilities

Graduates will gain an understanding of professional and ethical responsibilities through their education at OIT. Further they are expected to act with high professional and ethical standards.

Two assessments will be completed for this outcome. First, to judge the application of professional ethics senior project instructors will meet with a faculty committee to discuss and evaluate the ethical behavior of students in senior projects and other senior level courses. Second, a faculty committee will consider ethical behavior in freshman, sophomore and junior level classes. These groups will report findings back to the department as a written report. This report will contain recommendations for improvement.

The results of the MFG exit survey shows that only 33% of the respondents rate themselves as either prepared or highly prepared in this area.

OUTCOME j

A respect for diversity and knowledge of contemporary professional, societal and global issues

To be productive citizens, graduates need a broad understanding of world affairs and the impact of these affairs on the engineering profession.

Students take a broad range of social science and humanities electives. These give students a broad perspective of world affairs even though they are electives and each student will have a different mix of subjects. How these world affairs affect the engineering profession is discussed in the engineering courses, particularly upper division courses.

The rubric method was applied to an assignment involving evaluation of "Peak Oil" that was given during the winter term of Senior Projects. Over 83% of the students performed well.

The results of the MFG exit survey shows that 100% of the respondents rate themselves as either prepared or highly prepared in this area.

Overall students showed appropriate skills in evaluating contemporary issues in the context of their profession. No recommendations were forthcoming from assessment of this outcome.

OUTCOME k

A commitment to quality, timeliness, and continuous improvement

These attributes are addressed in all of the MFG program courses through the grading of homework and tests. Continuous improvement is constantly encouraged in progressive measures of presentation grading as the student advances in his studies.

The results of the MFG exit survey shows that 100% of the respondents rate themselves as either prepared or highly prepared in this area. Again, using this limited amount of data it is hard to derive any conclusive results. It is recommended that a second evaluation method be developed to evaluate this outcome, ant that this outcome be reevaluated next year.

OUTCOME MFG a

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.

No specific assessment has been done for this outcome. Next year this outcome will be assessed by at least two different methods.

OUTCOME MFG b

Graduates must demonstrate the ability to apply the technologies of materials, manufacturing processes, tooling, automation, production operations, maintenance, quality, industrial organization and management, and statistics to the solution of manufacturing problems.

No specific assessment has been done for this outcome. Next year this outcome will be assessed by at least two different methods.

OUTCOME MFG c

Graduates must demonstrate the ability to successfully complete a comprehensive design project related to the field of manufacturing.

No specific assessment has been done for this outcome. Next year this outcome will be assessed by at least two different methods.