Master's Program in Manufacturing Engineering Technology
2007-08 Annual Assessment Report

I. Introduction

The master's program in Manufacturing Engineering Technology offers courses in four curriculum content areas (CCA):

a. engineering science & design technology
b. manufacturing software & computer integration
c. advanced manufacturing materials & process technology
d. engineering management process

The Program requires 45 credit hours of graduate work. In addition to the CCA credit hours, students must complete 12 credits toward thesis, or 3 to 9 credits toward an approved final project and 3 credits in graduate seminars. Students must take at least one course in each of the four CCAs and three courses in at least one CCA.

II. Program Mission, Objectives and Learning Outcomes

The faculty of master's program of Manufacturing Engineering Technology communicated via emails during fall 2007 to review the current program. After some discussions, we agreed upon the final version as listed below:

Program Mission

The mission of the Manufacturing Engineering Technology Master of Science Degree program is to produce engineering graduates with an advanced technical education that allows them to take on leadership roles in globally competitive manufacturing industries.

Educational Objectives

1. Provide manufacturing and non-manufacturing engineers with advanced technical and managerial skills that allow them to be the leaders in manufacturing industries.
2. Expand graduates' expertise through industry-based applied research, lab-based design and analysis.
3. Strengthen graduates' ability to work productively in a global manufacturing environment.

Learning Outcomes

The graduates of Master of Science Degree program in Manufacturing Engineering Technology must demonstrate:

1. The ability to solve engineering problems using advanced mathematical, computational, and analytical methods appropriate to the discipline;

2. The ability to improve current manufacturing processes using a variety of techniques including product life cycle management, quality and inventory control and planning techniques.
3. The ability to understand, analyze and improve manufacturing practices through the use of current computer tools for product/process design, analysis and fabrication.
4. The ability to plan and conduct professional activities (including manufacturing projects) in one or more areas of specialization in the discipline by using advanced knowledge.
5. Knowledge related to leadership and global awareness.
6. The ability to communicate effectively in both written and oral forms.

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

The faculty agreed that we will have six main outcomes and will assess two each year on a three-year cycle, as listed in Table 1 below.

Learning Outcomes	**'07-08**	**'08-09**	**'09-10**	**'10-11**	**'11-12**	**'12-13**
1.Ability to solve engineering problems using advanced mathematical, computational, and analytical methods appropriate to the discipline;	X			X		
2.Ability to improve current manufacturing processes using a variety of techniques including product life cycle management, quality and inventory control and planning techniques.			X			X
3.Ability to understand, analyze and improve manufacturing practices through the use of current computer tools for product/process design, analysis and fabrication.		X			X	
4.Ability to plan and conduct professional activities (including manufacturing projects) in one or more areas of specialization in the discipline by using advanced knowledge.			X			X
5.Knowledge related to leadership and global awareness.		X			X	
6. Ability to communicate effectively in both written and oral forms.	X			X		

Table 1. Master's Program in Manufacturing Engineering Technology Assessment Cycle.

IV. Summary of 2007-08 Assessment Activities

Manufacturing faculty conducted formal assessment of two student learning outcomes during fall term 2007.

Student Learning Outcome #1: Ability to solve engineering problems using advanced mathematical, computational, and analytical methods appropriate to the discipline.

The Manufacturing faculty conducted an analysis of where this outcome is reflected in the curriculum. The mapping of this outcome to manufacturing courses can be found in Table 2 below.

Outcome	Year	Course	Instructor	Assessment Methods
Ability to solve engineering problems using advanced mathematical, computational, and analytical methods appropriate to the discipline;	07-08 (fall)	MFG 598 *(Klamath Falls)*	Wangping Sun	Mid-term exam, final reports, final exam
		MFG 597 Data Acquisition *(Boeing)*	Nathan Mead	Programming projects, and project reports
		MFG 531 Engineering Mechanics (*Metro)*	Larry Wolf	

Table 2. Course Mapping for Outcome #1.

The faculty assessed three graduate courses. Since there are currently only a small group of graduate students, these results should be viewed with that in mind. The exams, final project, and other projects were used for the assessment. A rubric with a five-point scale (1 for poor – 5 for excellent) was used to determine student progress. The expected point scale is 4 or above for all students.

For MFG 598 Quality Concepts and Philosophies, the students met the expectation. The performance criteria are: 1) computation accuracy in mid-term exam; 2) use of control charts to address quality problems; 3) use of statistical equations to solve quality problems and 4) basic concepts about quality issues. The assessment shows that the students can use correct equations to set up correct control charts. They can also use correct methods to address related quality problems.

For MFG 531 Engineering Mechanics, the students met the expectation. The performance criteria are: 1) ability to state the problem; 2) ability to use theoretical principles and 3) ability to apply mathematical techniques. The assessment shows that the students established fundamental understanding of problem solving.

For MFG 597 Data Acquisition, the students achieved all of the primary objectives of the outcome. The performance criteria are: 1) ability to apply current computational hardware and software to tasks requiring data acquisition and analysis; 2) ability to relate theoretical concepts requiring mathematical analysis to practical problems and 3) ability to use real-world data to derive physical constants of the system from which a mathematical model can be constructed.

To sum up, the student learning outcome #1 has been achieved. In the future, more extensive and comprehensive exercises, projects and course materials will be introduced into the program to further strengthen Outcome #1.

Detailed records of the assessment can be found in the department assessment coordinator's notebook.

Student Learning Outcome #6: Ability to communicate effectively in both written and oral forms.

The Manufacturing faculty conducted an analysis of where this outcome is reflected in the curriculum. The mapping of this outcome to manufacturing courses can be found in table 3 below.

Ability to communicate effectively in both written and oral forms.	07 – 08 (fall)	MFG 598 Quality Concepts and Philosophies (*Klamath Falls*)	Wangping Sun	On-site visit report; final report; final presentations.
		MFG 531 Engineering Mechanics (*Metro*)	Larry Wolf	Final project reports

Table 3. Course Mapping for Outcome #6.

Student work from MFG 598, Quality Concepts and Philosophies, was examined to determine student progress during the term. Students' reports for on-site visit, final reports and final presentations were used for the assessment. A rubric (1-5, poor-excellent) was used to determine student progress with a score of 4 or better for all students. The performance criteria are: 1) clearness and conciseness of the project summary; 2) clearness and conciseness of the explanation of the issues, methodologies to solve the issues; 3) clearness and conciseness of the conclusions; 4) knowledge of subject; 5) presentation organization; 6) delivery and discussion. The students met the expectations for writing and oral communication skills.

Student work from MFG 531, Engineering Mechanics, was examined to determine student progress during the term. Group discussion of final projects, group discussion of final projects and three final take home problem reports were used for the assessment.

A rubric (1-5, poor-excellent) was used to determine student progress. The performance criteria are: 1) clearness and conciseness of summary of understanding of the projects; 2) clearness and conciseness of the explanation of the problems encountered and 3) clearness and conciseness of the explanation of methods of attack to the problems. The students met the expectation of the instructor.

In summary, Outcome #6 has been achieved. In the future, more efforts will be put to strengthen the student ability to present the results of analytical data with the help of computer tools and programming.

Detailed records of the assessment can be found in the department assessment coordinator's notebook.

V. Evidence of Student Learning

During the 2007-08 academic year, the faculty of the Master's Program in Manufacturing Engineering Technology formally assessed the student learning outcomes summarized below.

Student Learning Outcome #1: <u>Ability to solve engineering problems using advanced mathematical, computational, and analytical methods appropriate to the discipline.</u>

Strengths: The students demonstrated proficiency or higher in computation accuracy, use of control charts to address quality problems, use of statistical equations to solve quality problems, basic concepts about quality issues, ability to state the problem, ability to use theoretical principles, ability to apply mathematical techniques, ability to apply current computational hardware and software to tasks requiring data acquisition and analysis, ability to relate theoretical concepts requiring mathematical analysis to practical problems, and ability to use real-world data to derive physical constants of the system from which a mathematical model can be constructed.

Areas needing improvement: None at this time.

Student Learning Outcome #6: <u>Ability to communicate effectively in both written and oral forms.</u>

Strengths: Students demonstrated proficiency or higher in writing a clear and concise project summary, including explanation of the issues and methodologies to solve the issues, writing a clear and concise conclusion, knowledge of subject, presentation organization, delivery and discussion.

Areas needing improvement: None at this time.