

PROGRAM ASSESSMENT REPORT

2007-2008 Academic Year

Master of Science in Engineering

**Marshall University
College of Information Technology and
Engineering**

Division of Engineering

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MASTER OF SCIENCE IN ENGINEERING

I. Assessment Activities

A. Program Goals

The College of Information Technology and Engineering (CITE) has developed the following program objectives for the Master of Science in Engineering (MSE) degree.

- The program will provide a graduate engineering program with a strong, focused central core, with opportunities for concentrated study in engineering disciplines important to the region. These disciplines currently include areas of emphasis in engineering management, environmental engineering, and transportation and infrastructure engineering.
- The program will provide a program that meets the evolving needs of engineers and their employers in the region by enhancing technical engineering competence, management and leadership skills, and sensitivity to legal and ethical issues.
- The program will continuously monitor, evaluate, and revise existing academic programs through interactions with students and employers.
- The program will employ technology and other mechanisms to increase learning opportunities and make the program available and accessible at all locations in the region where sufficient demand exists.
- The program will take a leadership role in fostering the technological and economic development of the region by providing technological resources and professional development opportunities to the community and by developing a reputation for high-quality outcomes.
- The program will provide support for faculty to enhance competence and currency.
- The program will expose students to the managerial, legal, political, and ethical issues commonly associated with the practice of engineering.

These objectives were developed in 1999 and have not changed substantially during the reporting period. Various members of the professional engineering community and the engineering faculty continue to review and validate the goals, as discussed below.

B. Learning Outcomes/Data Collection

Based on guidance from the Marshall University Director of Assessment, we have chosen to focus this annual report on approximately one third of the student learning outcomes for the M.S. in Engineering degree program. For the 2007-2008 academic year, therefore, we look only at the learning outcomes for the *Engineering Management* area of emphasis within the M.S. in Engineering. The other two areas of emphasis learning outcomes will be the focus of future reports. Those other areas of emphasis are (1) *Environmental Engineering* and (2) *Transportation and Infrastructure Engineering*.

The learning outcomes, assessment measures, benchmarks, results, and analysis and actions taken for the *Engineering Management* area of emphasis are shown in Table 1. As shown, there are eight outcomes, with multiple assessment measures. Overall we are happy with the results of the outcomes and have clear measures of success for most of them. For a few of the outcomes our measures are perhaps slightly too subjective, which we will try to improve.

Table 2 show the Course/Outcomes Matrix for the Engineering Management area of emphasis within the M.S. in Engineering degree.

II. Plans for the Current Year

We plan to engage our new Engineering Advisory Board to help identify needs and give support to both the graduate and undergraduate engineering programs. We are excited to have this new group on board in an effort to improve our engineering programs! For now, that advisory board is focused mainly on ABET accreditation for the undergraduate engineering program, but we will also ask them to give us feedback on our graduate M.S. in Engineering program student learning outcomes.

CITE will continue to work on student learning outcomes for the M.S. in Engineering, particularly in developing more measureable outcomes for the *Environmental Engineering* and the *Transportation and Infrastructure Engineering* areas of emphasis, which were not the focus of this year's report.

III. Assistance Needed

As always, faculty require more funding and released time in order to pay meaningful attention to the development of a new assessment plan for CITE. Faculty also continue to need support for travel to conferences and development activities in order to stay current in their graduate education abilities and better to contribute to student education.

Submitted by:

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**TABLE 1: Assessment of Program's Student Learning Outcomes for the
M.S. in Engineering Degree Program
Marshall University
2007-2008**

Not every student learning outcome must be assessed every year. However, it is expected that at least one-third of the outcomes will be assessed each year, allowing for assessment of all outcomes within a three-year cycle. It also is important to use more than one assessment measure for each outcome.

NOTE: The M.S. in Engineering Degree has three Areas of Emphasis: (1) Engineering Management, (2) Environmental Engineering, and (3) Transportation and Infrastructure Engineering. For the 2007-2008 Assessment Report, we are focusing only on the outcomes for the Engineering Management Area of Emphasis. These are found below.

Program's Student Learning Outcomes	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
1. The student will demonstrate competence in planning technical projects through application of project management principles and tools.	1.A. Final team project in EM 660 (Project Management)	1.A. The students will achieve a mean score (a combined individual and team score) on the final team project report of at least 90%	1.A. Thirteen out of eighteen students received scores above 90%. The remaining five students received scores above 84%. The overall average score for all of the students was 94.5%.	1.A. Because roughly one fourth of the students scored between 84-90%, we will work to make final team project expectations clearer and strive to insure the students have adequate feedback on their progress.
	1.B. The student will plan and execute a comprehensive project	1.B. Each student will demonstrate comprehensive project planning effectiveness by passing the TE 699 Comprehensive Project course.	1.B. All M.S.E. graduating students achieved this level of performance.	1.B. Continue to assess how we can continually improve the TE 699 Comprehensive Project experience for the student.

Program's Student Learning Outcomes	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
<p>2. The student will demonstrate through written exercises and through team projects a clear understanding of the fundamental principles of the importance of people and teamwork in technical projects and effectively working with people in engineering situations.</p>	<p>2.A. Five written essay assignments in EM 660 (Project Management) that deal with interactions with people while working on projects</p> <p>2.B. Through team member evaluations of each other on the final team project in EM 660</p> <p>2.C. Final individual project for EM 620, which presents heavily challenging people and individual situations.</p>	<p>2.A. Students will average at least 90% on the five application-oriented people-focused essay assignments.</p> <p>2.B. Students will average at least 90% approval rating by fellow team members on how each student performed in a team environment working toward achieving project objectives</p> <p>2.C. Students will average at least 90% on this very difficult and extensive project.</p>	<p>2.A. Only two out of nineteen students had an average score lower than 90% on the five application-oriented people-focused essay assignments. The overall average of all students combined was greater than 90%.</p> <p>2.B. Out of eighteen students, all performed above the 90% approval rating. In fact, the average approval rating of each student by his/her peers was 98.3%! This would indicate a very high level of both understanding and application of people-interaction principles in a project environment.</p> <p>2.C. Twenty-three out of twenty-four students scored at 90% or higher.</p>	<p>2.A. Continue to work on helping the students to have assignments that require them to apply the principles of working with people in technical situations.</p> <p>2.B. Continue to use the techniques, methods, and principles we are using for this very important quality for success.</p> <p>2.C. Continue to use this difficult self-evaluation and people-interaction exercise to reach this learning outcome.</p>

Program's Student Learning Outcomes	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
3. The student will demonstrate the ability to apply the basic tools and concepts related to operations management.	3.A. Three application-oriented exams in EM 668 Operations Management.	3.A. Students will average at least 90% on the three application-oriented exams.	3.A. The average overall score for the three exams was 90.4% for the six students who took the exams. However, three of the six students had average scores below 90.4%. These three students each had average scores of 85.6%, 87.4%, and 89.4%. The other three students had average scores of 91.8%, 93.0%, and 95.5%.	3.A. We would like to have higher average exam scores for our engineering students on these operations management exams. To this end, the instructor will focus greater efforts on application-oriented instruction and assignments in order to increase the ability of the students to apply operations management concepts and tools.
4. The student will demonstrate the ability to evaluate a company's financial status.	4.A. TM612/EM 675 – Economic & Financial Analysis assignments, Exam 1 questions, and the Final Project require financial analysis and evaluation of Case Study and real-world companies.	4.A. TM612/EM 675 homework, Exam 1, and the Final Project demonstrate quantifiable knowledge for this Learning Outcome. A Final Report rubrics total of 90% is targeted.	4.A. Homework, Exam 1 and the Final Project support this Outcome for the two semesters it has been in place and the results recorded. Results, however, have not been formally tracked.	Will standardize type of financial analysis questions on Exam 1, implement rubrics for the Final Project, and develop a spreadsheet to track results beginning Spring 2009.

Program's Student Learning Outcomes	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
5. The student will demonstrate the ability to weigh the cost/benefit of technology decisions.	5.A. TM612/EM 675 – Economic and Financial Analysis assignments and Exam 2 are cost/benefit financial analysis exercises.	5.A. TM612/EM 675 homework assignments and Exam 2 require utilization of time value of money (cost/benefit). A 90% score is targeted.	5.A. In 2006, 40% of the students earned less than 90% on Exam 2. In 2008, 47% earned less than 90%. (no data available for 2007).	5.A. Review and compare Exam 2 questions to assure consistency in testing and measurement. Begin tracking student Exam scores.
6. The student will demonstrate the ability to communicate effectively, through written assignments and through public speaking presentations.	6.A. Fifteen written essay assignments in EM 620 (Management of Technical Human Resources, including an additional final comprehensive written personal project. 6.B. Written and orally presented Comprehensive Project Report for TE 699 (Comprehensive Project). 6.C. Public speaking assignments in EM 620 Seminar in Engineering Management.	6.A. Students will average at least 90% on all written assignments in EM 620. 6.B. Students will receive a passing grade on the written and orally presented Comprehensive Project Report for TE 699. 6.C. Students will average at least 95% on these presentations.	6.A. Out of 24 students, 21 received overall scores above 90% on the fifteen written assignments. 6.B. All students who completed TE 699 received passing grades. 6.C. All students received averages above 95%.	6.A. This result is satisfying and we will continue to emphasize good writing skills through these assignments. 6.B. This outcome is somewhat subjective in nature. We will look into what possibilities there might be to make this outcome evaluation more objective through rubric development. 6.C. The rubric for determining the grading is somewhat subjective; will try to increase objectivity.

Program's Student Learning Outcomes	Assessment Measures (Tools)	Benchmarks	Results	Analysis/ Planned Actions
<p>7. The student will demonstrate awareness and understanding of professional, ethical, and legal responsibilities.</p>	<p>7.A. Performance in</p> <ul style="list-style-type: none"> • EM 620 (Management of Technical Human Resources and Organizations), • EM 660 (Project Management), and • EM 694 (Engineering Law). <p>7.B. Professional licensure and/or certification; and employer feedback</p>	<p>7.A. Abilities to adequately demonstrate professional understanding and conduct as observed by faculty and fellow students; and through exams.</p> <p>7.B. Professional Engineering Licensure; Project Management Professional Certification</p>	<p>7.A. Students appear to understand the concepts and principles. This is both subjective and objective through the assignments and exams and the classroom discussions in EM 620, EM 660, and EM 694.</p> <p>7.B. Many of our students are already licensed Professional Engineers. Observation and employer feedback through focus groups has indicated that our students understand and apply these concepts—this is subjective.</p>	<p>7.A. Continued emphasis on these important topics. We will attempt to develop more objective measures and rubrics for these important topics.</p> <p>7.B. We will continue to ask for feedback from our Engineering Advisory Board</p>
<p>8. The student will apply statistical analysis concepts appropriately</p>	<p>8.A. Assignments in courses which require statistical analysis</p> <p>8.B. When needed in the TE 699 course (Comprehensive Project)</p>	<p>8.A. Students should demonstrate appropriate use of applied statistics in coursework</p> <p>8.B. Use ENGR 610 material appropriately as needed</p>	<p>8.A. Subjectively, the students do this in their engineering courses. Objectively they do it in ENGR 610 assignments.</p> <p>8.B. Subjectively, the students do this. Objectively they do it to pass TE699, as needed.</p>	<p>8.A. Continue to observe and monitor the use of correct applied statistics concepts, tools, and principles in engineering coursework</p> <p>8.B. Continue to observe and monitor and look for areas in which student learning needs to be better.</p>

TABLE 2: Course/Outcomes Matrix

Department/Program: M.S. in Engineering

NOTE: Only the outcomes for the *Engineering Management* Area of Emphasis are shown for this year’s report.

Program’s Student Learning Outcomes	Courses Offered in the Major													
	EM 620	EM 660	EM 661	EM 668	EM 670	EM 675	EM 694	ENGR 610	TE 699					
1. The student will demonstrate competence in planning technical projects through application of project management principles and tools.		I, R, A	R, A						A					
2. The student will demonstrate through written exercises and through team projects a clear understanding of the fundamental principles of the importance of people and teamwork in technical projects and effectively working with people in engineering situations.	I, R, A	I, R, A	R, A		R, A				A					
3. The student will demonstrate the ability to apply the basic tools and concepts related to operations management.			R, A	I, R, A					A					
4. The student will demonstrate the ability to evaluate a company’s financial status.						I, R, A								
5. The student will demonstrate the ability to weigh the cost/benefit of technology decisions.				R, A		I, R, A			A					
6. The student will demonstrate the ability to communicate effectively, through written assignments and through public speaking presentations.	R, A	I, R, A			R, A		R, A		A					
7. The student will demonstrate awareness and understanding of professional, ethical, and legal responsibilities.	I, R, A	I, R, A					I, R, A		A					
8. The student will apply statistical analysis concepts appropriately		R, A	I, R, A	R, A				I, R, A	A					

I = Introduced; R = Reinforced; A = Assessed