GRADUATE ASSESSMENT PLAN:
DEPARTMENT OF MECHANICAL ENGINEERING
(JANUARY 31, 2003)

INTRODUCTION

The goal of any assessment plan is to determine how well the educational program conforms to the outcomes that were developed. The Department of Mechanical Engineering utilizes the following steps in the assessment process:

a. Long and short term planning
b. Revision of Departmental mission statement
c. Development of programmatic outcomes
d. Creation of assessment tools
e. Development of assessment calendar
f. Completion of faculty feedback loop
g. Revision of course and program

There are many constituent parts of program assessment, and all of these parts provide needed input into the revision process. It is very important that all department faculty and administration are involved in this process.

PROGRAM OBJECTIVES/OUTCOMES:

The graduate program of Master of Science in Mechanical Engineering at Northern Illinois University represents an extension of in-depth study for the sub-disciplines of the mechanical engineering profession including applied mechanics, dynamic systems and control, materials and manufacturing and thermal-fluid engineering. The in-depth study compliments and enhances the technical electives offered to undergraduate students at the senior level.

Graduates of the program will be prepared for successful professional careers in industry, research laboratories and government by demonstrating the following:

A. An ability to apply knowledge of mathematics, science, and engineering
B. An ability to design a system, component, or process to meet desired needs
C. An ability to function on multi-disciplinary teams
D. An ability to identify, formulate, and solve engineering problems and to conduct industrial research
E. An understanding of professional and ethical responsibility
F. An ability to communicate effectively in words and in writing
G. A recognition of the need for, and an ability to engage in lifelong learning
H. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
The following matrix shows the levels and the linkages between the program objectives and the assessment measures in the program.

<table>
<thead>
<tr>
<th>DEPARTMENT MISSION STATEMENT</th>
<th>OUTCOME CRITERIA</th>
<th>CRITERION SPECIFIC ASSESSMENT ACTIVITIES</th>
<th>EVALUATIVE METHODS &amp; MODE OF OUTCOME MEASUREMENT</th>
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<tbody>
<tr>
<td>The Department of Mechanical Engineering is dedicated to continual accomplishment of the University mission of the transmission, expansion, and application of knowledge through teaching, research, and professional and public service. The Department subscribes to the College Scope and Mission Statement in executing its mission.</td>
<td><strong>A.</strong> an ability to apply their knowledge of mathematics, science and engineering</td>
<td>Activities like using scientific principles to formulate engineering problems &amp; using mathematical calculations to solve the problems</td>
<td>Thesis/project Faculty Feedbacks Student Exit Survey Alumni Survey Employer Survey Transcripts Placement Info</td>
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<tr>
<td></td>
<td><strong>B.</strong> an ability to design a system, component, or process to meet desired needs</td>
<td>Activities like thinking creatively about an engineering objective before defining &amp; following an iterative design procedure to satisfy the need</td>
<td>Thesis/project Faculty Feedbacks Student Exit Survey Alumni Survey Employer Survey Ind. Advisory Board</td>
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<td></td>
<td><strong>C.</strong> an ability to function on multi-disciplinary teams (including work outside of class)</td>
<td>Activities like reconciling differences among team members, integrating the ideas of others &amp; contributing to the overall outcome</td>
<td>Thesis/project Faculty Feedbacks Employer Survey Ind. Advisory Board</td>
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<td></td>
<td><strong>D.</strong> an ability to identify, formulate, and solve engineering problems and to conduct industrial research</td>
<td>Activities like understanding what is needed, setting-up problems mathematically &amp; applying knowledge to new situations</td>
<td>Thesis/project Faculty Feedbacks Employer Survey Ind. Advisory Board</td>
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<td></td>
<td><strong>E.</strong> an understanding of professional and ethical responsibility</td>
<td>Activities like knowing the profession’s code of ethics, recognizing ethical dilemmas &amp; incorporating safety issues into design</td>
<td>Thesis/project Faculty Feedbacks Employer Survey Ind. Advisory Board</td>
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</table>

The instructional and research programs of the Department are focused on the inter-related needs of its major clients: the students, the industry, and the scientific community. Students are served by providing them with curricula that are rich in fundamental and advanced technology in emerging fields of industry. The Department is committed to maintaining a strong link with industry through training of its personnel as well as execution of technical projects through the vehicles of graduate thesis projects, faculty research projects, faculty and student internships, and faculty consulting. The Department shall have an active Board of Industrial Advisors to strengthen this link. The scientific community is served by active participation of faculty in scientific research at the forefront of engineering knowledge.

The Department recognizes its faculty as its most valuable resource and will recruit, develop, and retain faculty with proven...
ability in teaching and research. The faculty, through achieving professional recognition and through continuing involvement in sponsored engineering projects, will act as role models for students. The Department shall be a dynamic resource for the people of Illinois utilizing innovative offerings of its programs at on- and off-campus locations to maximize access to potential students.

The Department has a goal of being nationally and internationally recognized for the excellence of its instructional and research programs through a delicate balance between the fundamental and applied portions of its curricula and through a synergistic mix of teaching and research activities by its faculty.

F. an ability to communicate effectively in words and in writing

Activities like orally presenting your work, writing clear lab reports or papers, using graphics/presentation software, interviewing etc.

Thesis/project Faculty Feedbacks Alumni Survey Employer Survey Ind. Advisory Board

G. a recognition of the need for and an ability to engage in lifelong learning

Activities like learning on your own, keeping up with new technology, student groups, working co-ops or interning, conferences, journal subscribing etc.

Thesis/project Student Exit Survey Alumni Survey Employer Survey Ind. Advisory Board

H. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Activities like demonstrating knowledge of technical approaches & computer applications in eng. analysis, design, & experimentation

Thesis/project Faculty Feedbacks Student Exit Survey Alumni Survey Employer Survey Placement Info Ind. Advisory Board

### DESCRIPTION OF METHODS, TIMELINES, RESPONSIBILITIES, AND COVERAGE

The assessment of a program is a complex task, and one which must be multi-faceted in order to gain data. The Department of Mechanical Engineering employs multiple measures to assess the learning of its students. Faculty assessment of the thesis/project experience is a direct measure of student learning, where the students complete a thesis, project or research paper based upon their area of study within the program. The department regularly surveys the students, the alumni and the employers. It should be noted that as a mode of assessing the program in its entirety, the department examines job placement information and the benefits which were received through the degree completion. In addition, since the department deals with changing technology and skill sets, the department places a lot of assessment emphasis upon our advisory board and industrial interaction. Through meetings once per semester, as a whole, with the departmental Industrial Advisory Board, much information is learned and developed. At all of the meetings, the Chair and departmental faculty discuss curriculum issues with our industrial representatives. This interaction allows the department to ensure that the topics that our students learn not only satisfy our learning objectives, but they satisfy the educational needs of industry which employ our graduates.
<table>
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<tr>
<th>ASSESSMENT METHOD</th>
<th>USAGE OF METHOD</th>
<th>TIMELINE</th>
<th>RESPONSIBLE PARTIES</th>
<th>OBJECTIVES ADDRESSED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduate Thesis/Project</td>
<td>Thesis, project report, research paper written</td>
<td>Before graduation</td>
<td>Faculty and adjunct professors involved in thesis/project supervision</td>
<td>A through H listed above</td>
</tr>
<tr>
<td>Faculty Feedbacks</td>
<td>Faculty inputs through meetings, retreats or discussions</td>
<td>During semesters</td>
<td>Faculty</td>
<td>A through F, and H</td>
</tr>
<tr>
<td>Student Exit Survey</td>
<td>Survey given to graduates after graduation</td>
<td>Each semester − given after graduation</td>
<td>Department Chair to administer</td>
<td>A, B, G, H</td>
</tr>
<tr>
<td>Alumni Survey</td>
<td>1) University Assessment Office 2) Supplemental CEET survey</td>
<td>Both coinciding with university-wide survey administration, one, five, &amp; ten years after graduation</td>
<td>1) NIU Assessment Services Office 2) CEET Assessment Coordinator in consultation with Department Chair</td>
<td>A, B, F, G, H</td>
</tr>
<tr>
<td>Employer Survey</td>
<td>Outcome surveys to supervisors of coop &amp; intern participants</td>
<td>Every semester for coop/internship participants</td>
<td>Department Chair in coordination with the Departmental Internship coordinator</td>
<td>A through H listed above</td>
</tr>
<tr>
<td>Placement Info</td>
<td>Tracking employment &amp; related information of graduates</td>
<td>Conducted as supplemental addendum to the alumni survey</td>
<td>Department Chair in coordination with alumni office</td>
<td>A, H</td>
</tr>
<tr>
<td>Industrial Advisory Board Participation</td>
<td>Discussion and input into departmental graduate curriculum</td>
<td>Once per semester − time varies</td>
<td>Department Chair and faculty in the respective areas.</td>
<td>General programmatic issues</td>
</tr>
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**ACADEMIC YEAR ASSESSMENT SCHEDULE**

Assessment by the department is an ongoing, year-round process. The following table shows a typical semester-by-semester chronology.

<table>
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<tr>
<th>Semester</th>
<th>Regular Department Assessment Activities</th>
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<tbody>
<tr>
<td>Fall</td>
<td>• Conduct Advisory Board Meeting</td>
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<td>• Distribute minutes of advisory meetings and action items to faculty in given areas.</td>
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<tr>
<td></td>
<td>• Revision to curriculum committee due based upon feedback</td>
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<td></td>
<td>• Spring term course-level feedback from students to faculty</td>
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</tbody>
</table>
• Summer term course-level feedback from students to faculty
• Revision of survey forms if indicated
• Department reviews assessment feedback for continuous improvement
• Mailing of surveys to employers of summer intern participants
• Distribute fall term course-level faculty and student surveys
• Collect fall term course-level faculty and student surveys
• Data entry and analysis of faculty and student fall surveys begins
• Department and faculty review assessment feedback for improvement
• Preparation of supplemental alumni surveys for mailing with university alumni survey
• Data entry and analysis of faculty and student survey results begins
• Meetings with industry representatives to discuss programs

Spring
• Conduct Advisory Board Meeting
• Distribute minutes of advisory meetings and action items to faculty in given areas.
• Fall term course-level feedback from students to faculty
• Mailing of surveys to employers of Fall intern participants
• Distribute spring term course-level faculty and student surveys
• Collect spring term course-level faculty and student surveys
• Data entry and analysis of faculty and student spring surveys begins
• Department and faculty review assessment feedback for continuous improvement
• Data entry and analysis of faculty and student survey results begins
• Data entry and analysis of spring semester senior capstone experience and senior exit survey results begins
• Meetings with industry representatives to discuss programs

Summer
• Summer term course-level feedback from students to faculty
• Mailing of surveys to employers of spring intern participants
• Department and faculty review assessment feedback for continuous improvement
• Meetings with industry representatives to discuss programs

THE RELATIONSHIP BETWEEN ASSESSMENT AND CURRICULAR PLANNING

The department’s assessment activities are an integral of the curricular planning process. In order to facilitate change, one must identify the impetus for the change. The forms of assessment that the department are using provide for a very broad measure of the program, and how it allows the students to achieve their desired outcomes. One of the most valuable forms of program assessment is the industry advisory board. Through interaction with the board members, the chair and program faculty discuss issues that are of vital importance to our graduates and to the companies for which they are employed.

ASSESSMENT FEEDBACK AS A MECHANISM FOR CONTINUOUS IMPROVEMENT

The ultimate goal of any assessment program is to utilize the data gathered to make programmatic or course alterations where they are needed. The department has continuously
revised its graduate curriculum and course contents through its Curriculum Committee based on the feedbacks gathered through advisory board surveys, student exit surveys, alumni surveys, placement information and employer surveys. In a parallel process, the department is revising the assessment tools including the survey forms so that the needed information can be obtained through assessment surveys.

**CURRENT ASSESSMENT STATUS BY METHOD**

**Thesis/Project**

_Last year’s activities:_ Three-member faculty thesis committee evaluated the performance of student thesis using standard forms. The faculty project adviser reviewed the project report.

_Findings:_ The overall quality of theses varied significantly. Many students do not complete thesis within two years.

_This year’s activities:_ The department Graduate Curriculum Committee will evaluate the thesis formulation process and the forms used for this purpose. The Graduate Committee will recommend a mechanism to faculty to strengthen the thesis formulation process as well as evaluation of thesis work.

**Faculty Feedbacks**

_Last year’s activities:_ Faculty discussed and evaluated the graduate program in faculty meetings, retreats and through the Graduate Committee.

_Findings:_ The number of research assistants has increased from zero a year ago to 5 in the last year. More than one half students did not finish their degrees within the usual two-year period.

_This year’s activities:_ The department will engage in more activities to establish funded research projects. Graduate Committee is reviewing a thesis proposal that is to be enforced to assist all graduate students to formulate their thesis within one year of their study.

**Student Exit Surveys**

_This year’s activities:_ A supplemental exit survey is being developed for graduates with a master degree.

**Alumni Survey**

_This year’s activities:_ A supplemental survey is being developed for the graduate assessment. This survey will be sent out in 2003.

**Employer Survey**

_Last year’s activities:_ No data from the employers of graduates has been collected, but dozens of surveys from the employers of past internship participants were retrieved from the files and incorporated into the database along with recent responses.

_Findings:_ The employers of internship participants continue to rate our students’ work performance very favorably.
This year’s activities: Efforts should be made to contact the employers of our graduates, but we lack the resources to track them. Given the fragmentary nature of the Career Planning and Placement Office’s data and the dearth of current contact information, we need advice regarding how to do this in a cost-effective manner. Absent this, given the likelihood of extremely low response rates from the target group no matter what we do, we are content to continue present practice of partnering with the Cooperative Education Internship Program Office to survey the coop-intern employers where respondents are identifiable and response rates are comparatively high.

**Transcripts**

Last year’s activities: No systematic or aggregate analysis of student transcripts has been performed by the department because the current system only allows us to look up one electronic or paper record at a time.

Findings: Students are apprised of course scheduling and advised to take courses in sequences that minimize time-to-degree appropriate to their professional goals and interests.

This year’s activities: The department really needs to obtain past and current student record information that may be efficiently linked electronically to other assessment methods in a relational database environment to realize the full potential of this method.

**Placement Information**

Last year’s activities: No data regarding the placement of post-graduate graduates has been collected systematically by the department. The Career Planning and Placement Office data that depends on either student or employer voluntary reporting is of little utility due to its fragmentary nature.

Findings: Through these contacts, we have developed ties with companies and developed curricular improvements.

This year’s activities: We will continue to track as many graduates as possible. In the coming years, we will contact our past grads from the preceding year.

**Industrial Advisory Board interaction**

Last year’s activities: The Department Chair and faculty members in the areas of interest meet with the departmental Industrial Advisory Board in fall semester, 2002. The meeting covered current curriculum, assessment, student activities and lab tour. The meeting also focused on changes in industry that need to be reflected in graduate program, to produce students with the needed skills.

Findings: The IAB members were pleased with the program in general and pointed out the needs of communication skill as well as the too high student/faculty ratio of the program.

This year’s activities: The department is searching for two new faculty members and revising the survey forms used by the IAB members. The department will have two IAB meetings this year, one in spring and one in fall. The department is committed to build up stronger interactions with industry.