06-07 Assessment Report

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1. What goals or learning objectives/outcomes were assessed in AYs 2006-2007?

1. Demonstrate a knowledge of the science, mathematics, and engineering principles that are fundamental to thermal and mechanical systems design and manufacturing.
2. Plan, conduct, analyze, and interpret experiments and apply experimental results, using the principles of science and mathematics and appropriate computer technology.
3. Apply creativity in the design of systems, components, or processes to meet desired needs.
4. Function effectively as part of a multidisciplinary team.
5. Identify, analyze, and solve technical problems in the areas of machine design, including solid mechanics and control systems; fluid mechanics, thermodynamics, and heat transfer; materials properties and selection; and manufacturing, using the principles of multivariate calculus and differential equations, including the appropriate use of computer technology.
6. Show understanding of professional, ethical, and social responsibilities.
7. Communicate effectively through speaking, writing, and graphics, including the appropriate use of computer software.
8. Show understanding of the impact of engineering solutions in a global and societal context.
9. Show understanding of the need for a commitment to life-long learning and participation in professional societies.
10. Show understanding of contemporary issues.
11. Use the techniques, skills, and modern engineering tools necessary for engineering practice with proficiency in design, manufacturing, materials science, thermal and fluid systems.
2. How did you assess these learning outcomes?
   a. Describe the measures you used and the information gathered.
      (Description, date administered, results)

   1. **Course Surveys.** We administered a standardized survey for courses
      identified as indicators for the learning outcomes. The survey asked the
      students to rate the effectiveness of the course for each of the learning
      outcomes.
   2. **Graduating Senior Surveys.** We administered a short survey to the graduating
      seniors within the program. The survey was designed to get global feedback
      on the perceptions of the students on the effectiveness of the program.
   3. **Alumni Surveys.** We sent a survey to program Alumni. The survey was
      designed to gather information as to the effectiveness of the program by
      asking what information was most useful to the careers of our alumni.
   4. **Industrial Visits.** A faculty committee met with representatives of Composite
      Engineering. The representatives were asked questions as to the effectiveness
      of the program. The results of this meeting are available from Cici Matuzzi.
   5. **Senior Project Evaluation.** The senior design projects were evaluated by
      faculty and industry representatives. The evaluation was for both the
      technical content of the project and the quality of the design presentation.

   b. As a result of these assessments what did you learn about the program’s
      success in helping its students achieve these learning outcomes?

      The assessment identified several areas where the curriculum could be
      strengthened. These topics are being reviewed by the curriculum committee and
      the assessment committee. In addition, the assessment process was identified as
      an area which needed to be updated.

3. As a result of faculty reflection on these results, are there any program changes
   anticipated?

   **Assessment.** This assessment plan is currently under revision. It was found that the
   number of learning outcomes made it difficult to highlight what is truly important for our
   students and for industry in general. In addition, the basic assessment plan had no clear
   method for closing the loop to correct perceived problems. The first step in developing
   the new plan was to create a set of learning outcomes which made sense for the program
   and which could be effectively monitored. It was determined that the total number of
   learning outcomes would be reduced so that the relationship between the program
   objectives would more closely correlate with the outcomes. To create this set of
   outcomes the faculty were asked to answer the following questions:
If you were hiring a Mechanical Engineer for your own company in your area of expertise, what attributes would you consider to be the most important? What would you want to see from the student before you offered him/her a job? How would you want to verify the student actually had the attributes you wanted?

The results were used to create a new set of learning outcomes focused on the key attributes desired in a new graduate of the program.

a. **Documentation** – the student must be able to write a coherent technical report (e.g. lab, analysis, test, etc.), they must be able to create and understand an engineering drawing (e.g. machine drawing, process diagram, schematic, etc.), and they must be able to create and understand a technical graph/illustration/diagram.

b. **Expertise in Technology** – the students must be able to demonstrate competence (i.e. understand and apply key concepts) in dynamics and statics; thermodynamics, heat transfer, and fluids; manufacturing and mechanical design; and have an understanding of other engineering disciplines and technology tools.

c. **Design** – the student must be able to solve an open ended design problem.

d. **Teamwork** – the student must be able to work in teams and demonstrate the ability to delegate responsibilities, communicate requirements, and interact with teammates.

e. **Professional Practice** – the students will demonstrate an understanding of the necessity for continuing education and an understanding of the engineering code of ethics.

**Retention.** The faculty are reviewing the retention rate for the program. The order of the courses in the curriculum is being reviewed to improve the retention rate for incoming freshmen.

a. How will you know if these changes achieved the desired results?

4. Did your department engage in any other assessment activities such as the development of rubrics or course alignment?

The assessment committee is currently revising the methods for performing the program assessment. The program outcomes will be assessed using a variety of methods. The direct assessment methods include:

1. Evaluation of project documentation for the senior project classes. The assessment committee will evaluate the senior project reports for ME 190 and ME 191 using a standardized rubric. The reports will be evaluated for composition, technical content, and completeness. In addition, the design drawing packages within the senior project reports will be evaluated by a committee of faculty, industry representatives, and shop personnel.
2. Outside evaluation of the senior project presentations.
   The senior project presentations are evaluated by both faculty and industry representatives. The evaluation is based on content, presentation material, and teamwork.

3. Evaluation of technical competence using targeted exam questions in key classes.
   Courses have been selected within each area of expertise to be used as indicators of technical competence within that area. Targeted exam questions will be used to quantify the level of understanding from each of the classes.

4. Data from the FE exam.

Indirect assessment methods include:

1. Graduating senior surveys and Alumni surveys.
2. Targeted surveys of students at different levels of the program.
3. Interviews with local employers.
4. Employer Surveys.

5. What assessment activities are planned for the upcoming academic year?

The new assessment methods will be implemented to track the performance of the program versus the new set of learning outcomes. An emphasis will be placed on direct assessment within the classroom. The assessment committee is currently developing new rubrics for measuring the technical competence of the students in key courses within the program.

The curriculum committee is reviewing the order of the classes and the content to improve the retention rate for incoming freshmen.