



<b>Program:</b> B.S. Program of Mechanical Engineering	<b>Completed By:</b> Dr. Paul P. Lin, Chair
<b>Department:</b> Mechanical Engineering	<b>Date:</b> May 26, 2006

Goal 1: Ability to apply math, science and engineering knowledge				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	3.89/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	No further actions needed
	Senior exit survey	3.97/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	4.0/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME advisory committee questionnaire	3.83/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME alumni survey	4.13/5.0 > 3.25 (criterion)	Same as above	Same as above

**Analysis:** The lowest score comes from ME advisory committee's questionnaire, although it exceeds the department's criterion. This perhaps has to do with the fact that it was hard for the committee evaluators to assess our senior students' ability to apply math, science to engineering based solely on their proposal presentations and final project presentations. Therefore, evaluation relevance is considered reasonable, rather than direct. In terms of direct relevance, two tools fall into this category. They are the instructor's course reflection forms and senior design instructor assessment. As it can be seen, they both score very high.



Goal 2: Ability to perform experimental design and experimental data collection and analysis				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	3.67/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	Teach students how to perform experimental data collection and analysis
	Senior exit survey	3.84/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	3.0/5.0 < 3.5 (criterion)	Same as above	Same as above
	ME advisory committee questionnaire	3.62/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME alumni survey	3.9/5.0 > 3.25 (criterion)	Same as above	Same as above

**Analysis:** Although all the above scores meet the program outcome, none of them is above 4.0. This seems to suggest that experimental design, data collection and analysis need to be emphasized more in our curriculum.



Goal 3: Ability to perform engineering design (Thermal/Fluid and Machine Systems)				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	4.13/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	No further actions taken
	Senior exit survey	3.94/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	4.0/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME advisory committee questionnaire	3.68/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME alumni survey	4.2/5.0 > 3.25 (criterion)	Same as above	Same as above

**Analysis:** Once again the lowest score comes from ME advisory committee's questionnaire, although it exceeds the department's criterion. This perhaps has to do with the fact that it was hard for the committee evaluators to assess our senior students' ability to design a mechanical system simply by participating their proposal presentations and final project presentations. The ME advisory committee is very pleased with our continued improvement on the quality of our senior capstone designs. In terms of direct relevance, two tools fall into this category. They are the instructor's course reflection forms and senior design instructor assessment. As it can be seen, they both score very high.



Goal 4: Multidisciplinary teamwork				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	4.0/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	Encourage teamwork by giving more group projects
	Senior exit survey	3.5/5.0 = 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	4.0/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME advisory committee questionnaire	N/A		
	ME alumni survey	3.6/5.0 > 3.25 (criterion)	Same as above	Same as above

**Analysis:** The senior exit survey scored the lowest, which means that we need to emphasize more on multidisciplinary teamwork while they are in school. Generally speaking, junior and senior courses involved with design projects required teamwork. Our advisory committee was not asked about the teamwork.

Some examples of multidisciplinary teamwork projects are such as the SAE's Mini Baja Car that required collaboration between mechanical engineering and electrical engineering. The word "multidisciplinary teamwork" essentially contains two parts: Multiple disciplines and teamwork. The former can be complex depending upon the nature of multiple disciplines, while the latter can be relatively easy to achieve by working together for a group project.



Goal 5: Identification, formulation and solution of engineering problems				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	4.33/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	No further actions needed
	Senior exit survey	3.97/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	4.0/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME advisory committee questionnaire	N/A		
	ME alumni survey	4.0/5.0 > 3.25 (criterion)	Same as above	Same as above

**Analysis:** The scores are all very high, especially from the instructor's course reflection. It's interesting to note that our recent alumni gave a very high score, which means that they felt that they could properly identify, formulate and solve engineering problems with the education that they received from the ME program.



Goal 6: Understanding of professional and ethical responsibility				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	3.75/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	Requiring every student to take a course called "Engineering Ethics"
	Senior exit survey	3.91/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	3.0/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME advisory committee questionnaire	N/A		
	ME alumni survey	4.4/5.0 > 3.25 (criterion)	Same as above	Same as above

**Analysis:** Understanding of professional and ethical responsibilities can be better observed when the students are working on their senior design projects, and when our alumni engage in engineering practice. In regular courses, other than senior design, instructors often mentioned the importance of professional and ethical responsibility. In addition, all engineering students are required to take a Philosophy course entitled "Engineering Ethics". In terms of professional responsibility, many of our students join ASME, and some join SME and AIAA. The senior design instructor did not give a high score, perhaps because the instructor cannot easily evaluate the students' understanding of professional and ethical responsibility.



Goal 7: Communicate effectively				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	4.0/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	Discussions at faculty retreats, meetings & implementing ProSkills program*
	Senior exit survey	3.59/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	4.0/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME advisory committee questionnaire	3.49/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME alumni survey	4.3/5.0 > 3.25 (criterion)	Same as above	Same as above

\* ProSkill is a communication and other non-technical skill development program designed to address many of the most important communication and interpersonal skills required for successful careers in engineering. It includes the development of skills for studying, reading, listening, writing, speaking, time management, ethics, networking, project management, teamwork, business principles, diversity, interpersonal relationships, and career management. In this program, either an outside consultant or regular faculty typically gives ½ of one class lecture, for instance, about how to write a non-technical business letter to a hypothetical supervisor to explain his or her new design, and ask the students to do an excise. Afterward, the students receive scores and comments for their exercises. The scores are generally a part of the course grade.

**Analysis:** Engineering students are generally perceived to be lack of good communication skills. Communication can be divided into two categories: oral communication and written communication. The ME department recognized the need to enhance our students' writing skills as early as possible by requiring the freshmen course entitled "Technical Writing and Communication". This course was implemented in 1999. As a result, our faculty often mentioned that they were pleased with our students' writing and presentation skills.

In addition, we started to implement the "Pro Skills", formerly known as "WriteTalk" program in as early as 2002. This program complements our technical writing course by enhancing our students' writing, and in particular, oral presentation skills.



Goal 8: Understanding of global/social impact of engineering solutions and contemporary issues				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	3.6/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	Instructors should try to cover these issues in all the classes
	Senior exit survey	3.53/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	N/A		
	ME advisory committee questionnaire	N/A		
	ME alumni survey	3.9/5.0 > 3.25 (criterion)	Same as above	Same as above

**Analysis:** All assessment tools indicate that perhaps we need to do more in this category, even though they all met the criterion of the outcome. We do not believe that this outcome has a direct link to the quality of our curriculum. Understanding of global/social solution and contemporary issues are perceived as more informational than fundamental.



Goal 9: Need and ability to engage in lifelong learning				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	3.88/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	Discussions at faculty retreats, meetings & implementing ProSkills program*
	Senior exit survey	3.81/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	N/A		
	ME advisory committee questionnaire	N/A		
	ME alumni survey	3.74/5.0 > 3.25 (criterion)	Same as above	

\* ProSkill is a communication and other non-technical skill development program designed to address many of the most important communication and interpersonal skills required for successful careers in engineering. It includes the development of skills for studying, reading, listening, writing, speaking, time management, ethics, networking, project management, teamwork, business principles, diversity, interpersonal relationships, and career management. In this program, either an outside consultant or regular faculty typically gives 1/2 of one class lecture, for instance, about how to write a non-technical business letter to a hypothetical supervisor to explain his or her new design, and ask the students to do an excise. Afterward, the students receive scores and comments for their exercises. The scores are generally a part of the course grade.

**Analysis:** The alumni survey scored higher than the last time. While students are still in school, we try to convince them the importance of lifelong learning by encouraging them to do literature search through internet, and participating professional organization conferences and meetings. The department is very pleased with the high score from the alumni survey, since it has the most direct relevance for assessing the lifelong learning.



Goal 10: Modern engineering practice				
Outcomes	Research Methods	Findings	Review	Actions
	Instructor's course reflection form	4.29/5.0 > 3.5 (criterion)	by department faculty and chair on a continuous basis	No further actions needed
	Senior exit survey	3.88/5.0 > 3.5 (criterion)	Same as above	Same as above
	Senior design instructor assessment	5.0/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME advisory committee questionnaire	3.19/5.0 > 3.5 (criterion)	Same as above	Same as above
	ME alumni survey	4.1/5.0 > 3.25 (criterion)	Same as above	Same as above

**Analysis:** The scores are all high, especially from senior design instructor assessment and ME advisory committee questionnaire. Our alumni also thought that they have been engaging modern engineering practice since they graduated. The department is very pleased to learn that our advisory committee consisting of technical managers or group leaders in industry gave high remarks on our seniors' ability to practice modern engineering.



**Conclusion**

Overall, the B.S. program of Mechanical Engineering offers a very solid program that is constantly reviewed and updated. All the program outcomes set forth by the department about four years ago have been successfully achieved. The department had just gone through a rigorous program review by ABET (Accreditation Board of Engineering and Technology) in October 2004, and received a positive preliminary accreditation review report in March 2005. The results of our program assessments for 2006-07 continue to indicate that our students and instructors are pleased with the program that we offered.