School of Industrial Engineering and Management

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Degree Programs Assessed	Assessment Methods[1]	Number of Individuals Assessed
B.S.	Industrial Advisory Board (review of work and activities)	14*
	Fundamentals of Engineering Exam results (national in scope)	13
	Undergraduate Student Advisory Council	6**
	Senior exit surveys/interviews	26
	Capstone projects (with outside clients)	15
	Class grades	All
	Course outcome evaluations	All
M.S., M.I.E., and Ph.D.	Industrial Advisory Board	14*
	Graduate Student Advisory Council	6**
	Graduate exit surveys/interviews	12
	Graduate TA/RA performance evaluations (Fall 2003)	27
	Graduate TA/RA performance evaluations (Spring 2004)	25
	Thesis and dissertation proposals	All
	Thesis and dissertation defenses	All
	Class grades	All
	Course outcome evaluations	All

*Number of board members.

** Number of advisory group members.

[1]Assessment methods included capstone design project reviews, thesis and dissertation proposals and defenses, TA/RA performance evaluations, Fundamentals of Engineering Exam results, and a review by our Industrial Advisory Board of student work and IE&M activities and plans. Other methods included, exit surveys/interviews, student advisory group inputs, course outcome assessments, class grade summaries, and teaching evaluations. In addition, IE&M's undergraduate program underwent an accreditation site review by the EAC/ABET in Industrial Engineering as well as Engineering Management.

Analysis and Findings

During the past year IE&M completed its Self-Assessment for re-accreditation and underwent a site visit from the Engineering Accreditation Commission/Accreditation Board for Engineering and Technology (EAC/ABET). IE&M was examined for both Industrial Engineering and Engineering Management. This assessment was focused on the undergraduate program. The results of the assessment will be finalized later this summer. Feedback from the oral report during the closing meeting of the site visit as well as the draft report indicate that IE&M was successful in re-accreditation. Tentative information gained from the assessment pointed out that IE&M has a systematic process in place for assessment and management of it program. Based on feedback, IE&M has strengthened its documentation process regarding program exceptions and re-examined prerequisite structures in one course. One comment was received that IE&M has several, as many as five, faculty members who are eligible for retirement, therefore, planning for transition (as a result of retirements) will be critical.

IE&M continued to collected information from basic constituencies, which included alumni and employers, students, and faculty members. The Industrial Advisory Board (IAB) represents alumni and employers while student advisory councils represent the students. Survey information was collected on how well students perceive they meet the IE&M program objectives.

IE&M Educational Objectives: The educational program emphasizes the application of technologies and tools in the short term, and the ability to discover, acquire, and adapt new knowledge and skills in the long term, such that our graduates are prepared:

1. To define, analyze, and solve complex problems within and between enterprises.
2. To discover, understand, and incorporate appropriate new technologies in the design and operation of enterprises.
3. To lead/manage design, development, and improvement efforts that benefit customers, employees, and stakeholders
4. To function in culturally diverse teams, communicate in a professional manner, and uphold the ethical standards of the engineering profession.

Graduating students were asked to rate their abilities and their preparation regarding each objective. Results containing averages from the fall 2003 and spring 2004 exit surveys of BS and MS graduates provided the following information.

Undergraduates (Fall 2003 and Spring 2004, n=26)

1. Ability = 2.74 Preparation (at OSU) = 2.85
2. Ability = 2.56 Preparation = 2.46
3. Ability = 2.81 Preparation = 2.71
4. Ability = 3.15 Preparation = 2.89

Graduates (Fall 2003 and Spring 2004, n=12)

1. Ability = 2.83 Preparation = 2.92
2. Ability = 2.58 Preparation = 2.50
3. Ability = 3.00 Preparation = 2.92
4. Ability = 3.08 Preparation = 3.00

Scale: 0 = poor; 1 = marginal; 2 = good; 3 = very good; 4 = mastery/outstanding

Comparable statistics from fall 2002 and spring 2003 are presented below.

Undergraduates (Fall 2002 and Spring 2003, n=17)

1. Ability = 2.53 Preparation (at OSU) = 2.41
2. Ability = 2.35 Preparation = 1.94
3. Ability = 2.59 Preparation = 2.17
4. Ability = 2.94 Preparation = 2.53

Graduates (Fall 2002 and Spring 2003, n=11)

1. Ability = 2.27 Preparation = 2.27
2. Ability = 2.00 Preparation = 2.18
3. Ability = 2.45 Preparation = 2.73
4. Ability = 2.91 Preparation = 2.91

Scale: 0 = poor; 1 = marginal; 2 = good; 3 = very good; 4 = mastery/outstanding

IE&M's target is a "good" rating or above. All of the 2003-2004 statistics average above the "good" rating, with several in the "very good" range. The 2003-2004 statistics show a steady to increasing score as compared to the 2002-2003 statistics. We will continue to make improvements in order to move our performance to higher levels. Several improvements are listed in the next section.

We had 13 students sit for the Fundamentals of Engineering (FE) Exam this past year. The display below summarizes our FE exam results since 1998. Scores on the FE are provided for both the school and for the nation.

Exam Date	Number of Students (IE&M)	Number of IE Students (National)	IE&M Pass Rate	National Pass Rate
1998-2003 (AM section)	58	2,479	84%	70%
1998-2003 (PM section - general)	9	187	78%	63%
1998-2003 (PM section - IE)	49	2,292	86%	70%
April 1999 (AM and PM)	3	216	100%	75%
Oct 1999 (AM and PM)	11	175	100%	75%
April 2000 (AM and PM)	2	300	100%	69%
Oct 2000 (AM and PM)	6	160	83%	74%
April 2001 (AM and PM)	5	291	80%	65%
Oct 2001 (AM and PM)	4	181	75%	70%
April 2002 (AM and PM)	5	327	60%	67%
Oct 2002 (AM and PM)	9	223	78%	69%
April 2003 (AM and PM)	6	376	67%	70%
Oct 2003 (AM and PM)	7	230	100%	67%

About 25% of IE&M students complete the FE exam. These students (semester in and semester out) tend to represent a cross-section of our students in terms of academic achievement and gender. Demonstrated performance typically exceeds our expectation/target of being above the national average – April 2002 and 2003 were exceptions in a number of years. We are unable to explain these data points, but think it was likely a lack of student preparation on the part of a few of our students.

Although results may vary somewhat from semester to semester on the exam, overall our students appear to be nationally competitive in the FE. In addition to FE examination results, which typically fall above the national average, results in general indicate that the current program is solid.

Our faculty continues to win numerous educational awards. For example, Dr. [redacted] won the College Advising Award for his work in our graduate program. Drs. [redacted], and [redacted], have all won significant teaching awards in the past two years. In addition, over one-third of our faculty members are Fellows within their respective professional societies.

All in all, IE&M contends that our students meet our stated program objectives and outcomes. Nevertheless, we constantly strive to improve our process and results in educating our students for professional practice. Our old traditional engineering education approach always yielded several changes and improvements per year. Our outcome-related approach is helping us locate parts of our program faster and reduce our improvement cycle time, as well as provide a more sound basis for verifying that the changes are indeed improvements. A number of program and course-related improvements have been implemented (or are in the process of implementation). The lists below highlight the most significant programmatic improvements made in the past three years.

In addition, the IE&M faculty worked to develop a strategic plan, aligned with the College and University plans. The strategic plans are currently in the final draft stage, and are expected to be implemented in the coming year.

Uses of Assessment Results

We collect information at more detailed levels than that reflected in the overall exit survey and FE exam statistics above. We use open-ended questions on surveys and use the student advisory councils as sources for detailed information. Instructor evaluations of course outcome attainment and suggested improvements regarding the same are collected. This information helps us to locate specific issues and ideas. This information is fed back into the faculty at faculty meetings or at the two work sessions (one full day in the fall and one-half day in the spring) and to the IAB during their semi-annual on-site visits. Improvements are put in place for the next term or after proper approval from the University is obtained. For example, major course/curricular changes require several levels of approval and require at least one year to implement, whereas smaller improvements in a course or the curriculum can be implemented before the next term begins.

We continue to introduce significant changes in the program, courses, and physical resources. Program and course foci have been expanded and sharpened in all areas. A major undergraduate program redesign project, in collaboration with the Industrial Advisory Board, is in midstream. This redesign is in response to shifts in professional practice as well as internal program assessment.

In general improvements fall in three categories: (1) process, (2) program, and (3) courses. The lists below are a summary of major changes undertaken in IE&M as a result of program and course assessments over the past three years:

Process-related improvements

- The explicit naming and involvement of constituencies
- the reestablishment of the IAB – we completed our third year with our IAB in the spring of 2004.
- the formation and maintenance of the Student Advisory Councils.
- Development of a IE&M strategic plan (draft) – aligned with CEAT's and OSU Stillwater's plans – plan development involved the IAB and student advisory councils as well as the faculty.
- The Alumni Survey and its alignment with the program objectives statements.
- The Exit Survey and its alignment with the program objectives and outcomes.
- Better student-faculty communications.

Program-related improvements

- The redesign of the undergraduate curriculum (continuing into the current year).
- The redesign of the student advisory system (major work about two years ago, updates are on-going).
- The development of course portfolios, course outcomes, and formal instructor evaluations and the sharing of the information therein (IE&M course and instructor specific formats were introduced this past year).
- Major upgrades of student laboratories (major manufacturing science machines and tools were acquired and installed this past year).
- Upgraded presentation support with dedicated color printers for IE&M students (equipment was upgraded this past year).
- Restructuring of the course offerings prior to entry into senior projects (IEM 4913).
- Strengthen project management skills across the curriculum (need identified Fall 2002 and Spring 2003, completed in 2003-2004).
- More student-friendly IE&M Web site (work here is on-going, including course support for IEM courses).

Course-related improvements:

- Outcome-based course structures and performance surveys (transferred to scantron technology this past year).
- Course topic mappings to program outcomes and objectives (developed in conjunction with our re-accreditation visit).
- Restructuring and coordination of IEM 4913 (completed in 2004 – improvements are on-going).
- Coordination and action to make STAT 4033 more effective for IE&M students.
- Addition of a research methods course for undergraduates (IEM 4010).
- Numerous course-level improvements.
- Better coordination of Web-based educational materials (and movement to more secure files).

This past year we have completed the re-design of our capstone design course IEM 4913. The course now has a stronger component in project management and more nearly resembles an initial professional experience similar to one a graduate would encounter in their first professional position. These improvements are multi-dimensional and include project planning-management, reporting/communication, and teaming. Inputs from the IAB and students were used to develop and fine-tune the course to its present state. Information and experience gained from our client companies is also used to fine-tune the course and to help us select appropriate clients for the next offering. In summary, this improvement was the result of using a number of assessment tools and resources to redesign our most significant undergraduate course. The course will continue to evolve and improve through continuous improvement.

Resources are traditionally tight, however, we have made significant upgrades to our facilities in response to information we gained from our constituents. We have upgraded our office area to accommodate student needs in specialized software and hardware access for project work and communications work. We have upgraded our computers and color printing capabilities for our students, as they cannot get color capabilities at the CEAT labs. This last year we added a color laser printer for our students. These upgrades were in response to feedback from our students, especially through the Student Advisory Councils.

Hands-on experience is valued by our employers and appreciated by our students, based on information collected through exit surveys, advisory councils, and ad hoc discussions with students and employers. We completed a major upgrade of our manufacturing lab (with Engineering Technology as our partner). We are now a Haas Technical Center. As such, we purchased a CNC 4-axis machining center and were entrusted with a CNC lathe from Haas. This upgrade was long overdue, based on feedback from all constituencies, students, faculty, alumni, and employers. Other significant upgrades were made in our Work Performance and Ergonomics Laboratory. These upgrades included new computers, printers, electronic screw drivers, and other equipment. All-in-all these laboratory upgrades added about $250,000 of educational infrastructure for IE&M, after considering the leveraged part of the upgrades (i.e., the entrusted machine, tooling, …). These improvements involved constituencies in order to determine what would best suit IE&M student needs. Funds were obtained through the Master Lease Program.

Note: The tools and techniques that we are using in our assessment processes were gained in collaboration with the Office of University Assessment. Their work in alumni surveys (and other surveys) has been helpful in gaining perspectives that are beyond our departmental resource base.