

**Mechanical Engineering Technology**  
**Division of Engineering Technology**  
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Degree Program(s) Assessed	Assessment Methods	Number of Individuals Assessed
B. S. Mechanical Engineering Technology	Fluid Power Society Capstone Design Course Embedded Assessment Industrial Advisory Council Review Alumni Survey (OSU/OUA)	40 41 200+ 9 NA at this time

**Analysis of Findings**

External evaluators from project sponsors of our Capstone Design Course and paid jurors provided input in regards to the technical content and the oral and written reports prepared by the students. Videotapes were made of all the projects. The quality of both the written and oral reporting has been maintained. The paid jurors provided improved feedback that was lacking when only volunteer/peer review was used. The faculty assigned to this course for this time period has significant industrial experience and a history of successful design work.

The performance of students on embedded assessment consists of taking questions from the Fundamentals of Engineering exam and including them in regular testing exams. The number of students taking the FE exam continues to remain small and consists of only the best students. The continued procedure of using FE exam questions tests a majority of the MET student body and is much more representative. Testing which does not involve graduation implications has not been as successful such as the Fluid Power Certification test. A nationally scored exam for engineering technology students is continually under consideration. Web based discussions indicated strongly that this need is not being met.

The MET Mini-Baja team has been integrated with the MAE team. The team competed in Ohio and placed better than in previous years. The combination also helped support across various academic disciplines. There is continual concern over inadequate funding but the combination of the two programs should be beneficial. Also, the competition was scheduled prior to finals week which is an improvement over the past year.

In the Student Exit Interview, students were asked about the adequacy of the computer labs and software. The results were strongly positive with over 90 percent answering yes. Also, the students were asked about the appropriateness of the Math, Chemistry, and Physics sequence for their degree. Again, the response was strongly positive. No new information has been forthcoming from this survey.

Fluid Power Society (FPS) Certification Tests (Fall 2003 and Spring 2004): Ten students took the job performance test (Hydraulic) and nine of them passed the test. Nine students took the written test and five of them passed. The low pass rate on the written test according to the professor in charge can be attributed to students prematurely taking the test and/or not taking advantage of the review sessions made available to them. Conclusion: Students who have only completed the MET 2313 class should not be encouraged to take the written portion of the test in the future.

Fundamentals of Engineering Exam: Two professors continue taking questions from the FE and have reported that their students performed well on these exam questions. Performance of most students on the FE Exam questions was quite similar to their performance on the other test questions on the examinations. The specific courses were: GENT 3433 Basic Thermodynamics, GENT 4433 Heat Transfer, MET 3313 Applied Fluid Mechanics, and MET 4453 Applied Thermodynamics. Each test given in the 2002-2003 Academic Year in the courses listed above included four typical Fundamentals of Engineering Examination questions. In most cases, some small but significant fundamental calculation was needed to choose the most correct response. Each question involved the application of one or more fundamental essential concepts. Success rates of 75% have been reported.

In Fall 2001, MET 2103 Industrial Materials students (40 students) were given an exam with a total of 41 questions, 15 of which were from the Fundamentals of Engineering (FE) exam. Success of students on the FE questions correlated well with the student's success on the overall exam. The test score average was 73.6 and the FE score average on the 15 exam questions was 72.0. In Fall 2002, MET 2103 Industrial Materials students (53 students) were given a comparable exam with a test score of 79.4 result. The average score on the FE questions was 66.4. In both semesters, students were mixed in their appraisal of which was harder, the FE questions or the instructor questions. From the distribution of the scores, there appears to be no significant problem with the performance of our students based on national norms. This is the third year that FE exam questions have been embedded in regular MET exams.

Capstone Design Course (MET 4123 Senior Design Projects): (Fall 2003, 19 students, 5 project teams; Spring 2004, 22 students, 6 project teams) In the senior design project or capstone course, students work in teams of two or three to develop a mechanical design, which integrates their knowledge and skills acquired in their previous courses. Each student asks local industrial contacts for potential projects, formulates a suitable problem with the industrial sponsor, develops a project proposal, and presents the proposal to the class. Students, with guidance from the instructor, form teams to work on a subset of available projects. Each team develops a design, writes a report, and gives an oral presentation of their design to an audience of industrial sponsors, faculty, and students. Feedback to the instructor from industrial sponsors and other faculty members verify that the technical content and creativity of the student designs are consistently at a baccalaureate level or higher.

Paid jurors were used in both the Fall 2003 and Spring 2004 presentations. Their specific comments included:

- Student projects should be narrower in scope with more definitive requirements detailed by the sponsor, the instructor and the team.
- There is a need for more departmental faculty involved in the student team projects. Calculations without units, spelling, etc. needs attention.
- Presentation mechanics were good. Presentations were well rehearsed and reports were available.
- Some formalized method of selection of the projects should be discussed and a two semester sequence was suggested to the faculty.

### **Uses of Assessment Results**

Academic Program: The following is a continued summary of the changes that have been made as a result of recommendations of the faculty working with the Industrial Advisory Board:

Machine Design Curriculum Changes

CEAT Common Lab Concept

Provided ANSYS software

Students get better value on Lab Fees

FEA Course

Provides "New Technology Transfer" to MET students

Applied focus allows coverage of high-level analysis techniques industry needs

OSU-MET

Adequate student enrollment and faculty with proper skills to sustain regular offerings of two electives in each specialty area

Certification and State of the Art Technology

- AutoCAD, ProE, Rapid Prototyping, ANSYS
- Hydrasim, Designer, 3 or 4 Fluid Power Technician Certifications
- Strain Gage, MathCAD, Fast Fourier Transform
- MasterCAM, CMM, Injection Molding, Liquid Plastic Molding

Industrial Advisory Board: The Industrial Advisory Board was tasked to concentrate on those activities which support our TAC/ABET2K accreditation. Specifically, the following action items were identified:

1. Provide more input to them on the new ABET 2000 accreditation
2. Graph A-K for IAB to look at before the next meeting
3. Provide information on how IAB members can become ABET Evaluators
4. Develop objective statements for each course
5. Identify advisory board members that could be trained as TAC/ABET Evaluators

Results:

March 11, 2004 IAB meeting

Discussion Topics

1. Calculus use in the curriculum was discussed. Concepts are important and the uses should be demonstrated in class lecture and homework problems. Use was stressed but formal proofs are not as important. Commercial software now drives many of the designs performed by Engineering Technology graduates.
2. Interdisciplinary projects are a must to meet ABET requirements. Linking with FPST, Electronics, Construction Management and other across campus departments is needed.
3. Process assessment is needed. How well are our assessment activities planned?
4. Exit interviews at time of graduation probably do not give information about job performance and how well students are prepared for their eventual work assignment. For long term performance:
  - Job performance and their preparation for their career could be evaluated by graduates who have been working a minimum of one year and probably 2 years. Raises and promotions reported by our graduates would help satisfy ABET for performance of our students in the long term and at the same time relieve any anxiety that supervisors have in giving out this information. Students should be asked at graduation time if they would be willing to provide comments on the adequacy of their training after one or two years of employment. This could be part of their exit interview questionnaire.
  - Feedback from our graduates then could be used to continually assess our program output.

Short term evaluation can be obtained by

- Course evaluation with student input on how well course objectives were met
  - Student/program evaluation with the Senior Exit Interview form. This should be a face to face discussion before students leave the campus.
  - Course evaluation by faculty
    1. Student input
    2. A-K criteria
    3. Graded work (good/bad/average) every semester
    4. Sample work every semester especially near evaluation time plus multiple years for a measure of continuous improvement.
5. ABET hot buttons
    - a. Demonstration of team work
    - b. Oral presentations
    - c. Lifetime learning such as professional societies, ASME, SPE, short courses, CEAT Week
    - d. Multidisciplinary activities outside the department
  6. The department needs to have a uniform syllabi format (total or in-part)
  7. We need a standard template for our power point presentations which utilize OSU logo and date materials were prepared.
  8. Senior Design Course needs to be spread over two semesters to allow for more meaningful projects.

Action Items

1. May 12 is a date for all faculty to fill out FCAR forms for individual courses. IAB members are invited to attend.
2. Next IAB meeting was set for May 14, 2004. Faculty were asked to provide:
  - a. A-K matrix filled out for the MET curriculum
  - b. Updated syllabi in standardized format
  - c. Course objectives clearly stated as they relate to the curriculum and a-k matrix.
3. Revise the FCAR form for inclusion in the ABET/MET assessment process.
4. Revise the Senior Exit Interview form to include questions asking seniors if they would be willing to provide professional growth opportunities available to them in the past 2 years.

May 14, 2004 IAB meeting

ABET Progress

- faculty have submitted a-k materials. Need/fall spring courses to complete the matrix
- [REDACTED] has compiled a matrix
  - Estimates reversed from previous matrix– fewer X's – checks

- [REDACTED]: “diversity” issue being handled via “s”, “h”, “i” courses (social sciences, humanities, and international dimension)
  - Should probably focus on just a few courses
  - need to interact with s/h/i faculty to ensure that requirements are fulfilled.
  - Ethics should also be covered by MET, perhaps in Freshmen/Sophomore Course ([REDACTED] [REDACTED] to coordinate with other departments, colleges, etc.)
- MET is strengthening “s” & “j”
- More criteria “c” courses should be marked in the matrix.
- “b” & “c” are short but “g” is long
- “h” covered under [REDACTED] GENT courses

#### Overall Impressions

- Fine on “a”, short on “b” & “c”, long on “g”
- “i”, “j”, “k” need attention (work with other colleges)
- Ethics via student societies, outside speakers, ASME website, etc.
- Philosophy courses often have ethics content
- Ethics web sites, quizzes, etc.
- “TurnItIn.com” to check if plagiarism exists
- There should be many “a”, “b”, “f”s
- Syllabus should be consistent w/ matrix
- Syllabus course types should be consistent w/matrix

#### Course Assessment Reports

- Uniform syllabus will be offered:
  - Objectives, outcomes, prerequisites, req. textbook, ref. textbooks, class hours, course content, attendance, labs/reports, tests, presentation, misconduct/honesty, special accommodations, grading, weekly topics. a – k will be included in objectives/outcomes
  - Uniform Course Assessment will be offered (FCAR). Table of objectives/outcomes can be cut/pasted into course syllabus.
  - Some faculty have used bullet items instead of spread-sheet table.

[REDACTED]: “should also track departmental goals”

Feedback should be included in FCAR along w/potential improvements.

Trending toward spread-sheet table over bullet items

[REDACTED]: Course Evaluations

#### Overall Impressions

- Spread-sheet approach preferred. (landscape format)
- Include variety of feedback not just scores such as 3.64/4.00 for performance
- Long-term program of Continuous Quality Improvement (CQI) not fully covered. (CQI involves senior exit interviews, survey of 2yr/5yr graduates by Alumni Survey, etc.) “Strategic Plan” should also be helpful here.
- Lab improvements also need to be documented
- Ground Source Heat Pump coupling to MET (IGSHPA)
- International visitors/professors are on board
- Basic research, product development, faculty cooperating with NPDC
- Career Tech has equipment which can be used by MET. This includes:
  - Stereo Lithography
  - Automation of manufacturing, etc.
  - Advanced welding
  - Economic aspect of design & manufacturing

Strategic Planning – later

Senior Exam FE, etc.

- Sr. exam given in Sr. Design course. Include questions from FE exam and include math, physics, drawing, etc.
- Which if any national exam should be stressed/encouraged?
- Should Sr. Design be made a 2-semester course to: permit Sr. Exam,
- permit project management, support better projects.
- [REDACTED]: “take the exam a couple of times to see what the results are, then worry about ramifications.”

- “supply” a reference sheet (equations, etc.) that the students can use during the exam.
- Target for Sr. Exam end of Fall, 2004 semester. [REDACTED] to coordinate.
- 1-2 essay questions might be helpful also.

#### Strategic Planning

Mission statement, vision, core values, objectives, etc.

- “Where & what’s the market? Tulsa, OKC?”
- No MET offerings currently at OSU-Tulsa, OSU-OKC or OSU-Okmulgee
- Should MET investigate OKC area more because OU doesn’t have a technology program. Electro-mechanical emphasis may be a good fit.