Annual College Assessment Report for 2009-10

College of Engineering and Applied Sciences

A. What activities have the college undertaken to help departments with assessment?

To increase the faculty knowledge base on student learning outcome and program assessments, the College of Engineering and Applied Sciences (CEAS) continued the practice of supporting faculty professional development in 2009-10, particularly as they relate to ABET accreditation. CEAS supported the following faculty members attended training on outcome assessment/ABET accreditation:

- Dr. Andrew Kline, Associate Professor, Department of Paper Engineering, Chemical Engineering, and Imaging (PCI), attended an ABET Faculty Workshop on Assessment
- Dr. Raja Aravamuthan, Professor, (PCI), attended an ABET Evaluator Training.
- Dr. Said AbuBakr, Chair, PCI, attended the 2009 ABET Annual Meeting.
- Dr. Said AbuBakr, Chair, PCI, attended the 2010 ABET Symposium.

In 2009-10, the Associate Dean for Undergraduate Programs and Assessment, Dr. Edmund Tsang, provided support to department faculty and administrative assistants to input results of student learning outcome assessment on TracDAT. To reduce faculty workload on assessment, Dr. Tsang served as a liaison between CEAS faculty and Karen Stokes to customize the fields in TracDAT such that it can be used to document and report assessment results to meet the requirements of the annual department assessment impact report and ABET accreditation. In 2009-2010, a TracDAT unit for reporting program educational objectives, which measures the accomplishments of graduates three-to-five years in the work place, was created for each department in the College. A discussion was also begun with Ms. Stokes to include a field in TracDAT for performance criteria, which the departments will hope to use in 2011 to meet a new ABET evaluation criterion.

B. Based upon the departmental reports, what strengths and opportunities for improvement exist within the college with respect to assessment? Specific examples of both strengths and opportunities for improvement would be helpful here.

Some examples of the strengths demonstrated by the departments to use assessment to improve student learning include:

- A new course on Engineering Mathematics, ENGR 1990, was created by the faculty of the departments of Mechanical and Aeronautical Engineering and Electrical and Computer Engineering, with support from the Associate Dean for Undergraduate Programs and Assessment, to improve a student's ability to apply mathematics in engineering problems.
- The Department of Industrial and Manufacturing Engineering has initiated a new focus on product development in which a new course, Product Development Fundamentals, was piloted in Fall Semester 2009 as IME 4950.
- The Department of Computer Science will submit a proposal to the CEAS Curriculum Committee in Fall 2010 to combine the current two undergraduate programs to a single one that can be accredited so as to improve student learning in communication (written and oral), computer science theories, and profession ethics.
- The Department of Manufacturing Engineering will add an Excel assignment on depreciation and taxes to reinforce the students' understanding to increase their success on completing their design project.

- The Department of Electrical and Computer Engineering has reduced the required concentration areas for the Masters Program from five to four to better meet the scheduling needs of the graduate students due to attrition in the number of faculty.
- The Department of Paper Engineering, Chemical Engineering, and Imaging changed the name of the Imaging program to Graphic and Printing Science as results of input from alumni and employers.
- The Department of Paper Engineering, Chemical Engineering, and Imaging Created a new Unit Operation laboratory course (CHEG 4810) to include laboratory experiments in Fluid Mechanics, Heat Transfer and Mass transfer, implemented in Summer 1 2010.

An area for improvement for the coming academic year is graduate program assessment. While all the graduate programs have created assessment plans in 2008-09, few have implemented them and only one department has collected data on student learning outcomes. Some departments used 2009-2010 to modify the graduate program assessment plans and to develop measurable learning outcomes.

C. What assistance to the college would be helpful to address the opportunities for improvement identified in B above? If there are any other areas where assistance would help beyond those identified from the opportunities for improvement mentioned in B, please feel free to comment on those.

The University Assessment Steering Committee can assist the faculty of the College of Engineering and Applied Sciences to improve the assessment of student learning outcomes by making available the results of student learning outcome assessment from all the programs across the institution. This would allow the CEAS faculty to benchmark their assessment practices and to learn new methods of assessing student learning outcomes, both at the undergraduate and graduate levels.

Appendix 1. Department of Computer Science Annual Assessment Impact Report

Appendix 2. Department of Electrical and Computer Engineering Annual Assessment Impact Report
Appendix 3. Department of Industrial and Manufacturing Engineering Annual Assessment Impact Report
Appendix 4. Department of Manufacturing Engineering Annual Assessment Impact Report
Appendix 5. Department of Mechanical and Aeronautical Engineering Assessment Impact Report
Appendix 6. Department of Paper Engineering, Chemical Engineering, and Imaging Annual Assessment Impact Report.

Attachment:
Department of Civil and Construction Engineering Annual Assessment Impact Report

Appendix 1.

Department of Computer Science Western Michigan University Assessment Report – July 2010

Summarize the assessment activities at both the undergraduate and graduate levels during the last year.

- The primary focus this year has been on assessment of undergraduate programs, particularly of the ABET/CAC accredited program. A portion of almost all department meetings was devoted to assessment involving the development of course assessment tools and coordination of those with course syllabuses.
- We implemented a new course assessment tool that should identify areas of strengths and weaknesses as relates to the ABET criteria. In addition, we continued with the exit interviews of graduating seniors.
- Currently, we are attempting to locate our graduates from undergraduate programs over the past five years, concentrating primarily on the Theory and Analysis major program. The plan is to complete this effort by mid to late August 2010.
- In the previous years, our Graduate Committee put together, in collaboration with the College Graduate Program and Research Council, an assessment plan for the master's and Ph.D. programs. The plan has flaws, in that measurement of outcomes is difficult to accomplish. The goal was to refine these plans with implementable outcomes and measurements; however, due to the urgency of getting the undergraduate assessment improved for the upcoming ABET review, this was not accomplished.

Have there been any changes in assessment activities from that in the approved assessment plan of the unit? If so, what initiated the change?

In the 2008/2009 academic year, two faculty members attended different conferences, one dealing entirely with assessment and another with an assessment workshop. Based on the presentations there, both faculty members recommended an assessment plan for ABET accreditation that was presented at both conferences. This resulted in significantly revised course assessment tools. In addition to the change in the tools, the assessment plan is constructed to identify areas of strength and weakness (needed improvement) rather than setting a minimal passing criteria for each outcome. While it has been a significant amount of work to change the plan, the tracking of data and identification of needed improvement should be simplified, once it is fully completed. Similar ideas can be used for assessment of the graduate programs as well.

How have the assessment results been used to improve student learning at the undergraduate and graduate levels?

- A recommendation of the Focus Group that convened in spring 2009 was that the Department move to one undergraduate major program that would be accredited. Students currently in the unaccredited program get much less or no exposure to ethics, communication skills, and computer science theory than do the students in the accredited major. Moving to one accredited program would improve the learning for those students. We spent much of the past year in sorting out how best to do this and progress has been made. The goal is to have a recommendation to the College Curriculum Committee this coming fall term.
- A finding in last year's assessment was that the role of pair programming in CS 1110, which contributes to ABET outcome d, was not clear and that a decision should be made to incorporate completely or remove it. During the 2009/2010 academic year, pair programming was incorporated as a requirement in all CS1110 laboratory sections. A survey of students related to pair program was given. A large majority reported that it was beneficial.
- The required development of a webpage was removed as a learning outcome of CS2230/2240, as it didn't seem to fit there as a requirement. It will instead be one measurable component for showing good communication skills.
- Assessment activities for the 2009/2010 year have identified a number of actions to take during the upcoming academic year.

Appendix 2

Electrical & Computer Engineering

Western Michigan University – 4601 Campus Drive

Memo

To: Edmund Tsang

From: John Gesink

Date: June 24, 2010

Re: ECE Annual Assessment Impact report for 2009-10

---

1. The required TRACDAT assessment impact report for ECE is available via the internet.

2. The answers requested for the three questions (A, B and C below) are given immediately following the questions. Please let me know if you have any questions.

   A. Summarize the assessment activities at both the undergraduate and graduate levels during the last year.

      i. Faculty, via their course reports, continued to submit course level assessments for learning outcomes assigned to their courses. This data was compiled and entered into the departmental outcomes notebooks by program. Using the data collected between Fall 07-SumI 09 and as scheduled by our undergraduate assessment plan, four learning outcomes (B, D, F & G) were assessed at the program level. The result was that all direct and indirect measures for these outcomes met the departmental performance targets thus establishing that these outcomes had been achieved.

      ii. Senior surveys are used as one of our undergraduate program assessment instruments. Two sets of these surveys were collected, and the previous three year results were analyzed and the data compiled for use in assessing the programs.

      iii. As specified in our 6-year-cycle assessment plan, program alumni and their employers were surveyed. The survey data is being analyzed and reviewed and will be used to determine if we are achieving program objectives in both our Bachelor's and Master's programs.

iv. Data on direct assessment measures in all of our graduate programs was collected. Our graduate programs assessment plan specifies review and compilation of this data on a 3 year cycle. Data has been collected for 08/09, 09/10, and will be for 10/11 and the report for overall performance for this cycle is scheduled to be completed in ~~for~~ spring 2012.

v. Driven by attrition in the number of departmental faculty and in order to meet scheduling needs of our MS students, a proposal to reduce the number required concentration areas in our MS programs from 5 to 4 was developed and presented and supported by both the faculty and our advisory board. This change is being implemented. Additionally the faculty is working on a 3 year course-offering-plan to enable focus and student planning at the graduate level.

B. Have there been any changes in assessment activities from that in the approved assessment plan of the unit? If so, what initiated the change?

i. No. Modifications in assessment plans, if appropriate, will be implemented at the ends/beginnings of the multiyear cycles of each of the assessment plans. None of the cycles began or ended this past year.

C. How have the assessment results been used to improve student learning at the undergraduate and graduate levels?

i. A new experimental course, focusing on "C" programming language, is being offered in the CS department for the first time in the Fall of 2010. This change was driven by assessments in our course, ECE 2510, by several of the departmental faculty of the programming needs of our undergraduate Electrical Engineering students. The experimental "C" programming course will continue to be offered for several semesters while its effectiveness in delivering the needed changes in student achievement are assessed. If results are positive, the new course will be adopted as part of the Electrical Engineering curriculum.

ii. We are still in the early stages of implementing the new MS and PhD program assessment plans and do not yet have assessment results that can be used to improve student learning at the graduate level.

Appendix 3

2009-10 IME Department Assessment Impact Report

A. *Summarize the assessment activities at both the undergraduate and graduate levels during the last year.*

1. New Product Development Foci

With WMU's elimination of the ID program elements of product design have been embedded within the Industrial and Entrepreneurial Engineering (IEE) and the new Engineering Design Technology (EDT) majors. Student feedback in IME 3010 and IME 3420 has helped to sharpen the product development activities within the major. IME 1430 was piloted as IME 4950 in Fall of 2009. The result was so successful that upper level students rushed to add IME 1430 in fall 2010. The one lab was overloaded by 55% and many of the incoming freshmen did not get into the class.

2. Performance criteria

Performance criteria were developed in response to changes from ABET and in preparation for the upcoming ABET visit in 2011-12. Details on the design and implementation of the performance criteria are shared in Section B.

3. Advisory board survey

We conducted an advisory board survey in April 2010. The purpose of this survey was twofold: 1) to obtain advisory board input into our programs for improvement purposes and 2) to gauge the effectiveness of the board, its structure, and the desired tenure of board members.

4. Graduate student reviews

Spring 2010 represented the first comprehensive review of all IME graduate students (60 MS, 25 MSE and 20 PhD). This activity was coupled with the annual discussion of recipient selection for assistantships/associateships. Gift monies were used to facilitate a half day retreat of the IME graduate faculty. The retreat allowed faculty to focus on the review process. Prior to the meeting, graduate advisors reviewed student files and brought those folders for students in academic difficulty to the meeting.

The 105 students were separated on the basis of level and GPA. Students with high GPA's were sent letters of commendation and given higher consideration for assistantships/associateships. Please see the attached nine letters that represent the range of feedback given to students. Those MS/E students with a GPA between 3.0 and 3.2 were warned that their performance, although satisfactory thus far, needed to be improved or at least maintained. Students below 3.0 were sent one of two letters requiring them to improve their academic standing. Those students with the lowest GPA's were told that if dismissed they would not be considered for readmission. PhD students were sent one for five letters, depending upon academic standing and where they were with regard to comprehensive exams and their dissertation/proposal.

B. *Have there been any changes in assessment activities from that in the approved assessment plan of the unit? If so, what initiated the change?*

1. ABET outcomes *a-k* have changed in wording from "Program Outcomes" to "Student Outcomes." We adapted our documentation accordingly.

2. EAC will have *a-l* to accommodate entrepreneurship. Student Outcome *l* is "**(*l*) an understanding of the entrepreneurial process including how to design, develop and bring new products and processes to market."**

3. We identified a set of performance measures to track our efforts across the student outcomes for each program. Currently, each BS program has program educational objectives (PEOs) with a unique set of ABET student outcomes assigned to each PEO (e.g., *a-k* outcomes are used only once). Each ABET student outcome will now be assessed using *performance criteria*. As defined by ABET, Inc., *performance criteria* are "specific, measurable statements identifying the performance(s) required to meet the outcome; confirmable through evidence."

Following initial discussion, examples, and a brief training session, faculty formulated performance criteria for each ABET student outcome *(a-k),* identifying between three and six criteria (measures) that, assessed together, combine to assess each outcome's achievement. In a retreat, faculty reviewed all proposed criteria, critiqued and discussed their applicability and suitability for the four curricula, and identified specific assignments within courses that could be measured and assessed to support achievement. These assignments were each put into a template which lists: a. Program Objective, b. Student Outcome, c. Performance Criterion, d. Course Activity, e. Detailed activity description, f. Metric (percent and achievement rate), g. Performance against metric and h. Date of last measurement. Documents that accompany one of these templates might include course assignment sheets and rubrics. (See <IME4910-E2.BA.doc> as an example.)

We then refined our SLO matrices to focus assessment efforts to achieve the greatest possible benefit while conserving the faculty and administrative labor in conducting these assessments. As such, our SLO matrices show at least three (3) performance measurements for each ABET student outcome and each course has at least two (2) measurements showing its key contribution to the respective curricula. Because some courses are common to more than one IME curriculum, we have designed our performance criteria so the same course measurement can be used across programs.

The final list of performance criteria was agreed upon (version 8, attached) and will be used for the 2010-11 year of record.

4. The IME department conducted a graduate student review, detailed in the previous section. This change was initiated by the need 1) to ensure timely monitoring and feedback to students on their progress in their respective curricula and 2) to make decisions with graduate faculty input on the allocation of graduate appointments. The new process immediately affected graduate student behavior.

A number of students subsequently met with their advisors to work out exactly what needed to change. Several dissertations/proposals saw a re-doubling of activities toward completion. Efforts are underway to "advise" several students out of the programs vs. simply flunking them out. The discussions resulted in identifying a couple of additional students to receive assistantships. Finally, the faculty appeared to gain a more global picture of the graduate student body. The activity was so successful that the procedure will be used for the next graduate review.

C. *How have the assessment results been used to improve student learning at the undergraduate and graduate levels?*

1. Joint programs with Kellogg Community College (KCC) and Muskegon Community College (MCC)

The IME department, working closely with the CEAS Advising Office, and in response to assessment of student and industry constituencies, has brought the new dual enrollment program with KCC on-line in 2009-10. Joe Petro of IME has been assigned to ensure a very clear and well-articulated path exists between IME and KCC. Joe Petro has been working with Sandy Blanchard in the CEAS Advising Office. In turn, Sandy has been working closely with Michael Houston the KCC advisor dedicated to the program. In just a team of WMU and MCC faculty and staff have begun the same process for students attending MCC. Review of the KCC framework, successes, and issues is being used to structure this new joint program.

2. Updating documentation for student and prospective student use

In response to feedback from students in exit surveys and other means of student feedback (e.g., informal conversations, e-mails), the IME department has been updating the various forms of documentation used by students and prospective students. Documents are being updated with revised curricular content, curricular forms, and new content on programs themselves. The following forms of documentation have been updated:

a. IME web site
b. Curriculum guides for all TAC programs
c. Recruiting materials

Documentation updates were done in preparation for the implementation of substantially revised curricula in our three technology (TAC) programs. Madeline McAuley the IME Webmaster has been using a series of sophisticated analytics to track the use of certain web features and thus drive development.

3. Chair denied readmission to students based on assessment of student learning.

During the 2009-10 academic year, the IME Chair denied readmission to five students into UEM because those students did not meet the minimum GPA requirements. The students were counseled to either chose a different program or were not readmitted into IME.

In addition to the narrative, please submit results of assessment of student learning outcomes for 2009-10 on TracDAT.

Appendices

1. Graduate student letter templates
2. Performance criteria listing
3. SLO chart (Example-UEM)
4. Course metrics (Example-IME 4120, IME 4920, IME 2620)

Appendix 1: Graduate student letter templates

Type 1: For GPA >3.20

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their graduate students. As a graduate student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME graduate students.

Based on this review we are pleased to inform you that your performance to date is consistent with our expectations as to how IME graduate students should be progressing. We commend you on your performance and look forward to continue to work with you as you proceed to graduation.

If you have any questions regarding this review, please contact your academic adviser.

Best wishes:

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

****

Type 2: For 3.00<GPA <3.20

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their graduate students. As a graduate student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME graduate students.

Based on this review we are concerned with your performance to date. We remind you that your Grade Point needs to be above 3.00 to be eligible for graduation, and encourage you to take the necessary steps to insure that you improve your GPA and remain eligible for graduation.

If you have any questions regarding this review, please contact your academic adviser.

Best wishes:

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

****

Type 3: For GPA <3.00 not on probation

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their graduate students. As a graduate student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME graduate students.

Based on this review we find that your Grade Point needs to be brought above 3.00 to be eligible for graduation. We urge you to take the necessary steps to insure that you improve your GPA and become eligible for graduation. If you do not improve your GPA you will be placed on probation, which may result in your dismissal.

If you have any questions regarding this review, please contact your academic adviser.

Best wishes:

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

****

Type 4: For GPA <3.00 and on probation

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their graduate students. As a graduate student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME graduate students.

Based on this review we find that you are currently on probation and remind you that your Grade Point needs to be brought above 3.00 to be eligible for graduation. We urge you to take the necessary steps to insure that you improve your GPA and become eligible for graduation. If you do not improve your GPA and are dismissed from the program, you will not be readmitted.

If you have any questions regarding this review, please contact your academic adviser.

Sincerely,

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

Dr. Paul V. Engelmann, IME Department Chair

Type 5: For Ph.D. Students who have passed comprehensive

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their Ph.D. students. As a Ph.D. student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME Ph.D. students.

Based on this review we are pleased to inform you that your performance to date is consistent with our expectations as to how IME Ph.D. students should be progressing. You have passed your Comprehensive Exams and currently are working with your Ph.D. Committee. We commend you on your performance and look forward to continue to work with you as you proceed to graduation.

If you have any questions regarding this review, please contact your academic adviser.

Best wishes:

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

Type 6: For Ph.D. student X

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their Ph.D. students. As a Ph.D. student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME Ph.D. students.

Based on this review we understand that you have passed your Comprehensive Exams. We expect that you now will be forming your committee and proceeding with your research. We urge you to focus on your research in order to graduate in a timely manner.

If you have any questions regarding this review, please contact your academic adviser.

Best wishes:

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

Type 7: For Ph.D. student Y

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their Ph.D. students. As a Ph.D. student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME Ph.D. students.

Based on this review we understand that you are currently working on completing the conditions to successfully pass your Comprehensive Exams. These conditions need to be successfully completed by the end of the 2010 Spring Semester, or you will be required to retake the Comprehensive Exam in the 2010 Fall Semester. Upon successful completion of your Comprehensive Exam, we expect that you will form your committee and proceed with your research.

If you have any questions regarding this review, please contact your academic adviser.

Sincerely,

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

Dr. Paul V. Engelmann, IME Department Chair

Type 8: For Ph.D. students who have not taken their comprehensive but are almost done with their course work

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their Ph.D. students. As a Ph.D. student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME Ph.D. students.

Based on this review we understand that you are in a position to take your Comprehensive Exams in the next academic year. You should meet with your academic adviser to develop a plan to take the Comprehensive Exam, so you can proceed with your research.

If you have any questions regarding this review, please contact your academic adviser.

Best wishes:

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

Type 9: For new Ph.D. students

Periodically all the departments within the College of Engineering and Applied Sciences review the status of their Ph.D. students. As a Ph.D. student enrolled in the Department of Industrial and Manufacturing Engineering, the Graduate Faculty has met and reviewed the performance of all IME Ph.D. students.

Based on this review we understand that you are currently fulfilling your course-work requirements for the Industrial Engineering Ph.D. Program. You should meet with your academic adviser to develop a plan to complete your course-work, take the Comprehensive Exam, and proceed with your research.

If you have any questions regarding this review, please contact your academic adviser.

Best wishes:

Dr. Azim Houshyar, Graduate Curriculum Committee Chair

Appendix 2. Performance criteria

Performance Criteria

A1. Selects appropriate CAx tools throughout the design and/or manufacturing process.

A2. Demonstrates effective use of one or more tools (CAD, Word, Excel, PowerPoint, CAE) in presentation, analysis, research of a design.

A3. Applies systems tools (LP, MSM) to model and solve problems.

B1. Selects and uses tools or technologies to transfer design information.

B2. Applies appropriate statistical techniques.

B3. Uses appropriate engineering, science, and/or mathematical tools for decision making (OR, statics, materials).

B4. Uses standard design information to determine appropriate application procedures.

C1. Gathers and uses data to assess process and product quality.

C2. Uses experiments and their results to improve a process.

C3. Uses decision making tools to analyze or improve a process or system

---

D1. Creates models and/or product designs using various design tools.

D2. Modifies CAx tools to enhance design.

D3. Evaluates the performance of a system and/or process.

D4. Develops appropriate design parameters (use, dimensions, economics, life cycle) considering identified constraints and criteria.

D5. Identifies customer needs and performance criteria.

E1. Demonstrates follow-through on team commitments (peer reviews, meeting minutes).

E2. Researches and gathers information for team project.

E3. Supports team activities through professional behaviors.

E4. Contributes to team products.

E5. ICES #158: The group projects taught me valuable skills beyond just learning course content.

E6. ICES #214: I have learned how to work better in groups as a result of this course.

Appendix 3. SLO chart

(Example-UEM)

UEM

Engineering Management Technology: Program Educational Objectives, Students Outcomes, and Performance Criteria, Mapped to Courses, 2010-2011

Program Educational Objectives	1. Manage projects, people, and resources effectively				2. Engineer and improve manufacturing and service systems.		3. Build and use management tools to analyze and solve problems effectively and make decisions from a systems perspective		4. Communicate effectively in verbal, written, and graphical forms.	5. Pursue professional growth and interact effectively in work environments	
TAC Student Outcomes	a. Ability to select and apply the knowledge, techniques, skills, and modern tools of their disciplines to broadly-defined engineering technology activities	j. Knowledge of the impact of engineering technology solutions in a societal and global context	i. An understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity	k. Commitment to quality, timeliness, and continuous improvement	f. Ability to identify, analyze, and solve broadly-defined engineering technology problems	d. Ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives	b. Ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies	c. Ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes	g. Ability to communicate effectively regarding broadly-defined engineering technology activities	e. Ability to function effectively as a member or leader on a technical team	h. An understanding of the need for and an ability to engage in self-directed continuing professional development
Performance Criteria	A1. Selects appropriate CAx tools throughout the design process.	J1. Evaluates material/product disposal and end-of-use alternatives.	I1. Evaluates the ethical dimensions of professional engineering and technological practices.	K1. Establishes measurable product quality definitions for improvement.	F1. Defines technical problems, compares alternative options, and designs a solution.	D1. Creates product designs using various computer-aided design tools.	B1. Selects and uses tools or technologies (DXF, IGES, STL) to transfer design information.	C1. Gathers and uses data to assess process and product quality.	G1. Provides content that is factually correct, supported with evidence, and properly documented.	E1. Demonstrates follow-through on team commitments (peer reviews, meeting minutes).	H1. Attends and participates in activities of professional organizations.
	A2. Demonstrates the use of one or more tools (CAD, Word, Excel, PowerPoint, CAE) in presentation, analysis, research of a design.	J2. Applies knowledge that considers professional, societal, and/or global impact.	I2. Identifies ethical dilemmas and proposes solutions.	K2. Uses project management tools (task list, CPM, Gantt) to assist in the completion of projects in a timely fashion.	F2. Uses tools (CAx, simulation) to optimize product designs.	D2. Modifies CAx tools to enhance design.	B2. Applies appropriate statistical techniques.	C2. Uses experiments and their results to improve a process.	G2. Conveys technical information effectively in graphical form (posters, PPT, histograms, FEA outputs).	E2. Researches and gathers information for team project.	H2. Seeks and responds to learning activities outside the classroom setting.
	A3. Applies systems tools (LP, MSM) to model and solve problems.	J3. Evaluates societal impact of proposed solutions.	I3. Demonstrates professional and ethical behavior (attendance, punctuality, professional work submitted).	K3. Considers the role of time in the design process, in decision making, and/or in manufacturing and service processes.	F3. Applies tools and modeling techniques suited to the problem (DFDs, inventory control, FEA, OR, NPV).	D3. Evaluates the performance of a system or process.	B3. Uses appropriate engineering, science, and mathematical tools for decision making (OR, statics, materials).	C3. Uses decision making tools to analyze or improve a process or system	G3. Presents information in writing that is well-organized, addresses objectives, and meets required standards of grammar and language rules. (Aller has rubrics)	E3. Supports team activities through professional behaviors.	H3. Demonstrates an understanding of the current job market and job search process.
		J4. ICES #189: This course broadened my perspective of working in a global/societal context.	I4. Demonstrates a knowledge of professional codes.		F4. ICES #176: Did you Improve your ability to solve real problems in this field?	D4. Develops appropriate design parameters (use, dimensions, economics, life cycle) considering identified constraints and criteria.			G4. Presents information in oral format that is well-organized, useful, and effectively delivered. (Aller has rubrics)	E4. Contributes to team products.	H4. Articulates intention to pursue professional development (certification, advanced degrees).
		J5. Demonstrate an understanding of technology in society.				D5. Identifies customer needs and performance criteria.			G5. ICES #175: Improve ability to communicate clearly about this subject?	E5. ICES #158: The group projects taught me valuable skills beyond just learning course content.	
									G6. ICES #187: This course improved my ability to speak in public effectively	E6. ICES #214: I have learned how to work better in groups as a result of this course.	
Course Coordinator											
IME 1020 Swartz									G1 / G3 Research Paper 75/75		H2 Cover Letter/Resume/Career Report/Bronco Jobs 75/75
IME 1420 Urdarevik	A2 Assignment 12.3 80/80				F3 Assignment 11.2 80/80	D1 Assignment 10.2 80/80					
IME 1500 Sitkins		J2 Test 1, Question 8 and 14 75/80	I1 Ethics Assignment 1 80/75						G1 Group Project 5 75/75	E6 ICES Questions 70% get 3.5 or higher	
IME 2460 Rodriguez	A2 Final Assembly ??80					D1 Week 6/12 Assignment 80%					
IME 2610 Butt			I2 Space Shuttle Challenger Assignment 75/70				B2 Hypothosis Testing Assignment 75/70	C1 Descriptive Stat and Graphical Assesment 75/70			
IME 2810 Choudhury	A2 Comp. Assignment 75%						B3 Strength of Materials (Yield) to Offset Stress-Strain 85% of students develop				
IME 3020 Fiala									G4 PREPARE/PARTICIPATE IN FOUR GROUP PROJECT PRESENTATIONS 80% PASS	E1 PREPARE CONTRACT LOG/MEMO FOR ECH PROJECT 75% MEET DEADLINE	
IME 3050 Fredericks				K3 Time Study Assignment 80/70				C2			
IME 3120 Lyth	A3 LP Case 80/80						B3 Case Monte Carlo 80/80		G3 Written Case Analysis 80/80		
IME 3150 Fredericks					F4 ICES 176 X.X or higher		B3 Semester Project 80/70				

Appendix 4. Course metrics

IME 4910

Prepared by: Betsy Aller

Date: 5/14/10

UEM Program Objective	5. Pursue professional growth and interact effectively in work environments
TAC Student Outcome	e. Ability to function effectively as a member or leader on a technical team
Performance Criterion	E2 - Researches and gathers information for team project.
Activity	Contribute to team technical research report.
Description	As part of senior design team, perform research for background, design, and methodology for technical project. Co-write draft technical research report, and revise / rewrite as necessary for final version. Individual segments will be identified on draft and final versions.
Metric	80% score 80% or higher on report evaluation rubric *AND* on semester-end peer evaluation form
Performance against metric	85% scored 75% or higher on report evaluation rubric; peer evaluation forms not quantified for this purpose
Date of last measurement	Spring 2010

SLO cell data:

E2 Contribute to team technical research report. 80/80 on rubric *and* peer evaluation

Attachments:

IME 4120

Prepared by: Larry Mallak

Date: 5/11/10

UEM Program Objective	1. Manage projects, people, and resources effectively
TAC outcome	a. Ability to select and apply the knowledge, techniques, skills, and modern tools of their disciplines to broadly-defined engineering technology activities
Performance Criterion	A3—Applies systems tools (LP, MSM) to model and solve problems.
Activity	Construct a context diagram
Description	Name the domain. Draw an oval representing this domain. Iterate between imagining the information flows and the outside domains. Information flows help you think of outside domains and vice versa. Draw and label the rectangles for the outside agencies and lines for the information flows. Include a short narrative describing the context diagram and its components.
Metric	70% score 70% or higher
Performance against metric	50% scored 70% or higher
Date of last measurement	Fall 2009

SLO cell data:

A3 Construct a context diagram 70/70

IME 2620

Prepared by: Steven Butt

Date: 6/9/10

IEE Program Objective	1. Plan, design, analyze, model, improve and implement systems to optimize the utilization of people and facilities.
EAC outcome	e. an ability to identify, formulate, and solve engineering problems.
Performance Criterion	E2: Uses IEE tools (simulation, quality control,…) to improve product designs or processes.
Activity	Process Capability Assignment
Description	Complete a series of questions that quantify process capability and conformance measurements. In addition, investigate the economic impact of changes to the current process.
Metric	80% score 70% or higher
Performance against metric	88% scored 70% or higher
Date of last measurement	Spring 2010

SLO cell data:

E2 Process Capability Assignment 80/70

Attachments:

Appendix 4

Manufacturing Engineering Department Annual/Yearly Assessment Report, 2009-2010

A. Summarize the assessment activities at both the undergraduate and graduate levels during the last year.

We assess some outcomes in each course that we offer (MFE) on a regular basis. During the year we assessed outcomes in four courses: MFE 4420 (Quality Control), MFE 4440 (Simulation of Industrial Operations), MFE 4800 and 4820 (Senior Design I and II). We also periodically assess objectives (about ever three years), but none were done during this academic year (surveys used for objective assessment will be done during the 2010-2011 academic year).

The department posts its assessment report on its web site; this site has had 2275 visits as of April 2010!

B. Have there been any changes in assessment activities from that in the approved assessment plan of the unit? If so, what initiated the change?

The department reviews the assessment plan and findings at least annually and makes changes as needed (sometimes these are changes are to improve alignment of educational outcomes with specific courses, measures and criteria), to improve the overall education and learning objectives and outcomes.

Actions taken in 2009 to address and update the assessment plan include:

Outcome E: 07/06/2009 - An additional excel assignment will be given dealing with the handling of depreciation and taxes prior to the due date of the project. This will have a positive impact on the success rate of the project.
06/29/2009 - Instructor will modify course instruction next time to improve performance. Note that this criterion was only missed by one student not achieving

Outcome I: 07/01/2009 - All students in the program should now have taken the entrance exam prior to taking the exit exam; this should improve the pass rate on the exit exam (the entrance exam was first administered in 2007 and then again in 2009; however some of the students taking the exit exam in 2008 may not have taken the entrance exam in 2007 as they were further along in the program and missed the exam which is administered in MFE 1200.)

C. How have the assessment results been used to improve student learning at the undergraduate and graduate levels?
With respect to outcome E above, the added excel spreadsheet assignment, dealing with depreciation and taxes, reinforced the students' knowledge and understanding on the project assignment. The students are now better able to meet this educational outcome and perform at a satisfactory level. In addition to the stated action on Outcome I, a review was initiated to identify weaknesses in the students' performance on these standardized tests (assessments), so that in the future additional effort can be directly at increasing the performance in areas identified as weaknesses.

Appendix 5

Annual Report on the Measurement of Student Learning Outcomes

For Ongoing Program Improvement

Department of Mechanical and Aeronautical Engineering

July 9, 2010

A. Summarize the assessment activities at both the undergraduate and graduate levels during the last year.

Undergraduate Programs

All the following learning outcomes are assessed for mechanical and aeronautical undergraduate programs and the findings are reported on TracDAT.

Undergraduate ME program learning outcomes
1. An ability to apply knowledge of advanced mathematics through multivariate calculus and differential equations
2. An ability to apply knowledge of science
3. An ability to apply knowledge of engineering
4. An ability to design and conduct experiments, as well as to analyze and interpret data
5. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
6. An ability to function on multi-disciplinary teams
7. An ability to identify, formulate, and solve engineering problems
8. An understanding of professional and ethical responsibilities
9. A knowledge of contemporary issues
10. An ability to write effectively
11. An ability to speak effectively
12. An understanding of the impact of the engineering solutions in a global, economic, environmental, and societal context
13. A recognition of the need for, and ability to engage in life-long learning
14. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

15. Familiarity with statistics and linear algebra
16. An ability to work professionally in thermal systems including design and realization of such systems
17. An ability to work professionally in mechanical systems including the design and realization of such systems

Undergraduate AE program learning outcomes

1. An ability to apply knowledge of mathematics
2. An ability to apply knowledge of science
3. An ability to apply knowledge of engineering
4. An ability to design and conduct experiments, as well as to analyze and interpret data
5. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
6. An ability to function on multi-disciplinary teams
7. An ability to identify, formulate, and solve engineering problems
8. An understanding of professional and ethical responsibilities
9. A knowledge of contemporary issues
10. An ability to write effectively
11. An ability to speak effectively
12. An understanding of the impact of the engineering solutions in a global, economic, environmental, and societal context
13.A recognition of the need for, and ability to engage in life-long learning
14. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
15. A knowledge of aerodynamics
16. A knowledge of aerospace materials and structures
17. A knowledge of propulsion
18. A knowledge of flight mechanics and stability and control
19. Design competence that includes integration of aeronautical topics

Graduate Programs

There have not been any assessment activities. However, the assessment plan was modified and the changes were reported on TracDAT.

B. Have there been any changes in the assessment activities from that in the approved assessment plan for the unit? If so, what initiated the change?

Undergraduate Programs

There have not been any changes to the assessment plan for undergraduate programs.

Graduate Programs

The MAE department uses the student learning outcomes as the basis for the collection and analysis of data to support graduate program review. Specific data collection activities for the Graduate Program Assessment are summarized in the tables listed below.

This document represents a revision to the document approved in 2008-09 academic year by the department faculty. The MAE Graduate Curriculum Committee members (same members who outlined the 2008-09 document) felt that the 2008-09 version needed to be more specific so they took it upon themselves the task of revising the 2008-09 document which was given in last year's report. The new document (2009-10 version) was approved in January 2010 by the department faculty. The MAE Graduate Curriculum Committee members also built the necessary tools (forms, surveys, etc.) for the measurements listed below. These forms are also attached. It is now the task of Dr. Koorosh Naghshineh to facilitate this assessment and try to collect the necessary measurements retroactive to Fall 2009. This task is in process.

Assessment Timeline: An assessment report will be completed by the MAE Graduate Curriculum Committee every three years, and conveyed to the MAE faculty for review and discussion of appropriate action. The initial report will be completed in September 2012, for the Fall 2009 through Spring 2012 semester time period.

Student Learning Outcomes

a) *Master of Science in Engineering (Mechanical, Non-Thesis Option)*
   1) An ability to apply advanced knowledge of Mathematics to the solution of engineering problems.
   2) An advanced ability to identify, formulate and solve engineering problems.

b) *Master of Science in Engineering (Mechanical, Thesis Option)*
   1) An ability to apply advanced knowledge of Mathematics to the solution of engineering problems.
   2) An advanced ability to identify, formulate and solve engineering problems.
   3) An ability to participate in relevant engineering research culminating in a Master Thesis.
   4) An ability to effectively communicate technical concepts.
   5) An ability to acquire knowledge of current research and technology in field of specialty.

c) *Ph.D. in Mechanical Engineering*
   1) An ability to apply advanced knowledge of Mathematics to the solution of engineering problems.
   2) An advanced ability to identify, formulate and solve engineering problems.
   3) An ability to effectively communicate advanced technical concepts.
   4) An ability to conduct independent research culminating in a Ph.D. dissertation.
   5) An ability to evaluate the contributions of others to field of specialty

a) Master of Science in Engineering (Mechanical, Non-Thesis Option)

Outcome	**Assessment Methods**	**Evaluation Metrics**	**Person/Group responsible for conducting the assessment**	**Group responsible for reviewing the results**
1) An ability to apply advanced knowledge of Mathematics to the solution of engineering problems	Students are required to complete two Mathematics-intensive graduate-level courses	100% of students complete their Math requirement with a grade B or better	Graduate Advisor	Department Graduate Curriculum Committee
2) An advanced ability to identify, formulate and solve engineering problems	Graduate-level coursework	100% of students complete at least 2 ME 6xxx level courses with a grade of BA or better	Graduate Advisor	Department Graduate Curriculum Committee

b) Master of Science in Engineering (Mechanical, Thesis Option)

Outcome	**Assessment Methods**	**Evaluation Metrics**	**Person/Group responsible for conducting the assessment**	**Group responsible for reviewing results**
3) An ability to apply advanced knowledge of Mathematics to the solution of engineering problems	Students are required to complete two Mathematics-intensive graduate-level courses	100% of students complete their Math requirement with a grade B or better	Graduate Advisor	Department Graduate Curriculum Committee
4) An advanced ability to identify, formulate and solve engineering problems	Graduate-level coursework	100% of students complete at least 2 ME 6xxx level courses with a grade of BA or better	Graduate Advisor	Department Graduate Curriculum Committee
5) An ability to participate in relevant engineering research culminating in a Master Thesis	Publishing about the thesis as an evidence of relevancy	80% of graduates publish at least a conference paper about their thesis within a year of graduation.	Thesis advisor – Graduate Advisor will inquire one year after student graduation	Department Graduate Curriculum Committee
6) An ability to effectively communicate technical concepts	i) Written communication: thesis writing process as evaluated by the advisor ii) Oral communication: thesis defense as evaluated by the committee	i) 80% of graduates are evaluated as a competent technical writer by their advisor. ii) 80% of graduates receive an evaluation of 90% or better from a minimum of 2/3 of the committee	i) Thesis advisor will evaluate written communication ii) Thesis committee will evaluate oral communication	Department Graduate Curriculum Committee
7) An ability to acquire knowledge of current research and technology in field of specialty	Literature review in Master thesis	100% of graduates include a critical literature review that receive a positive evaluation by a minimum of 2/3 of the committee	Thesis committee	Department Graduate Curriculum Committee

c) Ph.D. in Mechanical Engineering

Outcome	**Assessment Methods**	**Evaluation Metrics**	**Person/Group responsible for conducting the assessment**	**Group responsible for reviewing the results**
1) An ability to apply advanced knowledge of Mathematics to the solution of engineering problems	Ph.D. committee will identify mathematical / numerical / computational content of dissertation and evaluate its significance	90% of dissertations posses significant mathematical content as evaluated by a minimum of 3/4 of the Ph.D. committee	Ph.D. committee	Department Graduate Curriculum Committee
2) An advanced ability to identify, formulate and solve engineering problems	Graduate level coursework	100% of students complete at least half of their ME 6xxx level courses with a grade of BA or better	Graduate Advisor	Department Graduate Curriculum Committee
3) An ability to effectively communicate advanced technical concepts.	i) Written communication: dissertation writing process as evaluated by the advisor ii) Oral communication: dissertation defense as evaluated by the committee	i) 90% of graduates are evaluated as a competent technical writer by their advisor ii) 80% of graduates receive an evaluation of 90% or better from a minimum of 3/4 of the committee	i) Ph.D. advisor for written communication ii) Ph.D. committee for oral communication.	Department Graduate Curriculum Committee
4) An ability to conduct independent research culminating in a Ph.D. dissertation	Ph.D. advisor will submit an outcome statement about the research independence level of the graduate	100% of graduates are evaluated positively	Ph.D. advisor	Department Graduate Curriculum Committee
5) An ability to evaluate the contributions of others to field of specialty	Literature reviews for research proposal and Ph.D. dissertation	100% of graduates include a evaluative literature review that receive a positive evaluation by a minimum of 3/4 of the committee	Ph.D. committee	Department Graduate Curriculum Committee

Evaluation form: M.S. Thesis in Mechanical Engineering

ADVISOR SECTION

Assessment Outcome 4: An ability to effectively communicate technical concepts

i) Competence in technical writing

Does the student possess competence in technical writing that allows effective communication? (Evaluate student ability based on writing during the final phases of the thesis process. Please answer **yes or no** and briefly justify your response.)

Evaluation form: M.S. Thesis in Mechanical Engineering

COMMITTEE SECTION (including advisor)

Assessment Outcome 4: An ability to effectively communicate technical concepts.

i) Competence in technical writing (feedback from each committee member to the advisor)

Does the student possess competence in technical writing that allows effective communication? (Evaluate student ability based on quality of writing in the thesis. Please answer **yes or no** and briefly justify your response.)

ii) Competence in oral communication

Does the student possess competence in oral communication that allows effective communication? (Evaluate student ability based on the thesis defense. Assign a numeric value out of 100 for three categories. Base the evaluation on expectations for a M.S. thesis defense.)

Guidelines for scoring: Good 90 and above, **Acceptable** 75-89, **Poor** 74 and below

Quality (Includes technical content, slide layout, and structure of the presentation):

Clarity (Includes technical descriptions of the work):

Question and Answer performance:

Evaluation form: M.S. Thesis in Mechanical Engineering

COMMITTEE SECTION CONTINUED (including advisor)

Assessment Outcome 5: An ability to acquire knowledge of current research and technology in field of specialty.

Did the student present a critical literature review that demonstrates an ability to acquire knowledge for current research in a technical field? (Evaluate student ability based on the thesis. Please answer **yes or no** and briefly justify your response.)

Evaluation form: Ph.D. Dissertation in Mechanical Engineering

ADVISOR SECTION

Assessment Outcome 3: An ability to effectively communicate advanced technical concepts.

i) Competence in technical writing

Does the student possess competence in technical writing that allows effective communication of advanced concepts? (Evaluate student ability based on writing during the final phases of the dissertation process. Please answer **yes or no** and briefly justify your response.)

Assessment Outcome 4: An ability to conduct independent research culminating in a Ph.D. dissertation.

Is the student capable of independent research? (Please answer **yes** or **no** and briefly justify your response.)

Evaluation form: Ph.D. Dissertation in Mechanical Engineering

COMMITTEE SECTION (including advisor)

Assessment Outcome 1: An ability to apply advanced knowledge of Mathematics to the solution of engineering problems

Does the dissertation have significant mathematical content? (Please answer **yes or no** and briefly justify your response. Base the evaluation on expectations for a Ph.D. dissertation in Mechanical Engineering.)

Assessment Outcome 3: An ability to communicate advanced technical concepts.

i) Competence in technical writing (feedback from each committee member to the advisor)

Does the student possess competence in technical writing that allows effective communication of advanced concepts? (Evaluate the student ability based on writing during the final phases of the dissertation process. Please answer **yes or no** and briefly justify your response.)

Evaluation form: Ph.D. Dissertation in Mechanical Engineering

COMMITTEE SECTION CONTINUED (including advisor)

ii) Competence in oral communication (as evaluated by each committee member)

Does the student possess competence in oral communication that allows effective communication of advanced concepts? (Evaluate student ability based on the dissertation defense. Assign a numeric value out of 100 for three categories. Base the evaluation on expectations for a Ph.D. dissertation defense.)

Guidelines for scoring: Good 90 and above, **Acceptable** 75-89, **Poor** 74 and below

Quality (Includes technical content, slide layout, and structure of the presentation):

Clarity (Includes technical descriptions of the work):

Question and Answer performance:

Evaluation form: Ph.D. Dissertation in Mechanical Engineering

COMMITTEE SECTION CONTINUED (including advisor)

Assessment Outcome 5: An ability to evaluate the contributions of others to field of specialty.

Did the student present an evaluative literature review that demonstrates an ability to discern the contributions of others to the field of specialty? (Evaluate student ability based on the dissertation. Please answer **yes or no** and briefly justify your response.)

C. How have the assessment results been used to improve student learning at the undergraduate and graduate levels.

Undergraduate Programs

Improving Student Learning for Mechanical and Aeronautical Engineering Programs

A.1 Introduction of EGR 1990

In recent years, the faculty of the Mechanical and Aeronautical engineering programs have observed that many undergraduate students are not able to easily apply mathematics to the solution of engineering problems. In fact, many beginning students do not see the connection between mathematics and engineering. Consequently, they often do not take mathematics courses seriously. Only later, when asked to apply mathematical techniques (with which they should be familiar) do they begin to understand the need for mathematics in engineering. At that point they often struggle and sometimes have to repeat courses as they work to overcome their weaknesses.

These weaknesses have also been identified through formal assessment of outcome #1 – ability to apply knowledge of advanced mathematics. For this outcome, Mechanical engineering students are assessed in ME 3560 Fluid Mechanics and ME 3600 Control Systems, and Aeronautical engineering students are assessed in ME 3600 Control Systems and AAE 3710 Aerodynamics II. In these courses problems have been noted in the application of algebra, trigonometry, calculus, and differential equations.

To begin to address this growing problem, a new pilot course ENGR 1990 Engineering Mathematics was designed and is now being taught. The course is based on EGR 101 Introductory Mathematics for Engineering Applications at Wright State University. EGR 101 was developed under a Course, Curriculum and Laboratory Improvement (CCLI) grant from the National Science Foundation. In Phase 3 of this project entitled "A National Model for Engineering Mathematics Education," Western Michigan University (WMU) and various other universities have developed and are now teaching similar courses.

ENGR 1990 was taught at WMU for the first time in Fall 2009. It is targeted for incoming, first-year students who are concurrently taking MATH 1180 Precalculus, and it is the anchor class for that Learning Community. It currently serves as a substitute for CHEM 1120/1130 or PHYS 309/310 in the Mechanical Engineering and Aeronautical Engineering curricula, and it may be

used as an elective course in the Electrical Engineering curriculum. The course is intended to help students:

- Learn to apply mathematics to the solution of introductory engineering problems
- Learn how mathematics is used throughout their engineering curricula
- Strengthen their basic mathematical skills
- Develop strong study habits
- Become familiar (as first-year students) with faculty in the Engineering college

After teaching the course for four semesters, the results will then be reviewed to determine the effectiveness of the course in terms of student learning and retention. At that time, recommendations will be made to the College regarding future implementations of this or similar courses.

Detailed course notes and homework assignments are available at:

http://www.mae.wmich.edu/faculty/kamman/engr_1990.htm

A.2 Curriculum Improvement Aeronautical Engineering

Based on the input received by the aeronautical engineering (AE) faculty from students, the following changes were recommended by the AE faculty and were approved by the MAE faculty.

A.2.1 Change the course name for AAE4500 Flight Vehicle Aerodynamics to AAE3800 Flight Vehicle Dynamics and offer the course in the sixth semester instead of the seventh semester. This change will re-distribute core AE courses and lighten the load for the seventh semester by reducing the number of AE core courses in the seventh semester which includes four core AE courses (AAE4500, AAE4600, AAE4630, and AAE4660) and ME4790. These courses are demanding and require substantial amount of time. For the past six years, it has been observed that students struggle with the amount of work load during the seventh semester.

A.2.2 Add an extra pre-requisite course ME3600 Control System for AAE4600 Aircraft Stability and Control to force all the AE students to take ME3600 before taking AAE 4600. The concepts covered in ME 3600 are essential for understanding aircraft stability and control subjects covered in AAE4600 during the last four weeks of the course.

A.2.3 Change the following requirement for the Bachelor of Science in AE.

Current Requirement

"A student is required to earn a grade of "C" or better in all 1000-2000 level departmental pre-requisite courses before enrollment is permitted in the next sequence course."

This requirement is changed to the following

"A student is required to earn a grade of "C" or better in all 1000-3000 level departmental pre-requisite courses before enrollment is permitted in the next sequence course."

These changes are initiated to improve the level of preparedness of the students as they take 4000 level core AE courses in their senior year before graduation.

Graduate Programs

An assessment report will be completed by the MAE Graduate Curriculum Committee every three years, and conveyed to the MAE faculty for review and discussion of appropriate action. The initial report will be completed in September 2012, for the Fall 2009 through Spring 2012 semester time period.

Appendix 6

Department Assessment and Action Plan

Department of Paper Engineering, Chemical Engineering, and Imaging

Western Michigan University

College of Engineering and Applied Sciences

July 9, 2010

Reviewed and approved by PCI Assessment Committee

WESTERN MICHIGAN UNIVERSITY

To: **Anthony Vizzini, Dean**
College of Engineering and Applied Sciences

Edmund Tsang, Associate Dean
College of Engineering and Applied Sciences

From: **Said AbuBakr, Chair,**
Department of Paper Engineering, Chemical Engineering, and Imaging

Subject: **PCI 2009-10 Assessment Report**

Date: **July 9, 2010**

Please find enclosed the 2009-10 PCI Department Assessment Report that includes:

1. Summary of all assessment activities

2. Changes in assessment activities from the approved assessment plan

3. Summary of improvements based on the assessment results

4. TRACDAT impact report describing results of assessment

5. A letter from the PCI assessment committee chair

1. Summary of assessment activities:

- ✓ **Adopted the standard a-k ABET engineering outcomes for Paper and Chemical Engineering programs, and the Applied Science for the Imaging program. The a-k outcome mapping to courses is shown in appendix 1 for paper engineering, chemical engineering and Imaging programs.**

- ✓ **Established the process of assessment by having the Department Assessment Committee review outcome assessment and make recommendations to the curricular committee and final approval by faculty**

- ✓ **Continuing our ABET course reporting to include direct (homework, lab reports, quizzes, exams) and indirect (course retrospective) measures**

- ✓ **Implemented course and curricular changes as suggested by faculty and industrial advisory committees, and approved by the faculty. This includes:**

  1. **Changed the name of Imaging program to Graphic and Printing Science to be effective Fall 2011**
  2. **Created a new Unit Operation laboratory course (CHEG 4810) to include laboratory experiments in Fluid Mechanics, Heat Transfer and Mass transfer, implemented in Summer 1 2010**
  3. **Reviewed the Imaging curriculum to explore including prepress operations and packaging courses in the curriculum**
  4. **Conducting semiannual senior exit interviews, the results of which used to improve the curriculum**
  5. **Conducted employers and alumni survey to measure our program objectives. The results show that our graduates are performing well and all five objectives are met**

- ✓ **Developed new and measurable outcomes and objectives for the graduate program, data are being collected and the complete graduate program report is due September 18 as approved by CEAS graduate committee. The 2008 graduate program assessment and action plan is given in appendix C.**

  Curricular changes at the graduate level in this period includes:

  1. **Established a new accelerated MS program in Paper and Imaging science and engineering to be effective Fall 2010**
  2. **Rewrote and resubmitted the old MS in Chemical Engineering to be offered starting Fall 2011**

2. Changes in assessment activities from that in the approved assessment plan of the unit

No major changes made during this period

3. Summary of improvements based on the assessment results

The improvement as a result of these recent changes will be only seen in a few years in subsequent course reports, employer/alumni survey and enrollment data.

4. TRACDAT impact report describing results of assessment of student learning outcomes

Please review on line

5. A letter from the PCI assessment committee chair

Memo

Western Michigan University
Department of Paper Engineering, Chemical Engineering and Imaging

To: Said AbuBakr, PCI Chair

From: Pete Parker, Chair – Assessment Committee

CC:

Date: July 2, 2010

Re: ABET – Continuous Assessment Process

ABET requires an ongoing assessment process. The basic steps in our assessment process are:

1. The course retrospective remains our major vehicle for documentation of achievement of program outcomes. The course retrospective should contain, at a minimum:
    a. What went OK
    b. What didn't go OK / Needs Improvement
    c. Grade distribution
    d. Outcomes assessment – one section for each outcome being assessed
    e. Outcomes survey results
2. Over the course of the semester, measure the achievement level of the outcomes using multiple instruments (e.g. homework problems, exam questions, quizzes, lab reports) to measure the achievement of each outcome multiple (2-5) times.
3. If changes were proposed at the last course offering and were implemented in the current offering, ensure that the impact of these changes is assessed..
4. As a component of the course retrospective, analyze the achievement level for each outcome. A summary table of achievement for each instrument and an overall achievement level should be part of the analysis.
5. Determine if the desired level (75% of the students achieving at least the 75% level) is being met. If the desired level is not being met, propose changes, either at the course or curriculum level.
6. As appropriate, discuss the impact of previous changes.

The retrospective should be completed by the 5th week of the following semester. Submit a written copy to Karen to be placed in the appropriate course notebook. Submit an electronic copy to the program's representative on the assessment committee .

We continue to struggle to have faculty complete the course retrospectives within a reasonable time frame. The major reason seems to be that faculty don't believe the process is particularly valuable and worth the time and effort of the process.

Dr. Andy Kline attended an ABET workshop in late fall and learned that ABET is planning on modifying the evaluation process to utilize assessment of performance criteria. Each outcome in Criterion 3 should have 3 to 5 Performance Criteria that are assessed. The purpose purportedly is to help ensure that faculty use the same criteria (i.e. the Performance Criteria) when assessing a specific Criterion 3 outcome. Dr. Kline is gathering example Performance Criteria and the assessment committee will review them and then develop appropriate criteria for the various program outcomes. According to the information Dr. Kline received at the workshop, this is not a time critical issue, but we should have some Performance Criteria developed and in use for our Fall, 2011 visit. Performance Criteria will not be part of 2011 visits, but have some in place and other being developed will indicate that we are involved in the ongoing improvement of the assessment process.

Appendix A: Department Procedure for ABET Assessment

Memo

Western Michigan University
Department of Paper Engineering, Chemical Engineering and Imaging

To: PCI Faculty

From: Pete Parker, Chair – Assessment Committee

CC: Said AbuBakr, PCI Chair

Date: June 13, 2008

Re: ABET – Continuous Assessment Process

ABET requires an ongoing assessment process. To that end, we need to continue the type of assessment work that we did for the Interim Visit last fall, with the exception that we do not need to retain examples of student work. Thus, the basic steps in our assessment process are:

7. The course retrospective remains our major vehicle for documentation of achievement of program outcomes. The course retrospective should contain, at a minimum:
    a. What went OK
    b. What didn't go OK / Needs Improvement
    c. Grade distribution
    d. Outcomes assessment – one section for each outcome being assessed
    e. Outcomes survey results
8. Review the attached tables to determine which Criterion 3 outcomes are being assessed in your course(s)
9. Over the course of the semester, measure the achievement level of the outcomes using multiple instruments (e.g. homework problems, exam questions, quizzes, lab reports) to measure the achievement of each outcome multiple (2-5) times.
10. If changes were proposed at the last course offering and were implemented in the current offering, ensure that the impact of these changes is assessed..
11. As a component of the course retrospective, analyze the achievement level for each outcome. A summary table of achievement for each instrument and an overall achievement level should be part of the analysis.
12. Determine if the desired level (75% of the students achieving at least the 75% level) is being met. If the desired level is not being met, propose changes, either at the course or curriculum level.

13. As appropriate, discuss the impact of previous changes.
14. Survey the students at the end of the semester to obtain their input as to the achievement level of all Criterion 3 outcomes associated with the course. Summarize these result in the course retrospective.

The retrospective should be completed by the 5th week of the following semester. Submit a written copy to Annette to be placed in the appropriate course notebook. Submit an electronic copy to the chair of the assessment committee.

ABET has also revised the criteria that need to be considered in a self-study. There are minor modifications to the wording and description of the various program names. The most significant change is the insertion of a new Criterion 4:

> Each program must show evidence of actions to improve the program. These actions should be based on available information, such as results from Criterion 2 and 3 processes.

It is not clear what constitutes "evidence of actions to improve the program", but we need to be thinking about how we show improvement in outcomes achievement. Thus, if an outcome is not met in one semester and we take actions to fix that, then we need evidence the change worked (or didn't work as the case may be). We will need to have ongoing discussion about the improvement process.