Accreditation of an Engineering Design Technology program

M. J. Keil
Department of Industrial and Manufacturing Engineering
Western Michigan University, Kalamazoo, MI 49008

P. V. Engelmann
Department of Industrial and Manufacturing Engineering
Western Michigan University, Kalamazoo, MI 49008

ABSTRACT *- Accreditation is a daunting but necessary task. The Engineering Graphics and Design Technology program at Western Michigan University went through the accreditation process under the new TAC of ABET guidelines in 2005. Based on accreditation team observations design content needed to be increased and the curriculum needed to be changed to sufficiently differentiate it from other programs. Beyond that, input was solicited from alumni, employers, and students. This paper follows the assessment process of meetings, surveys, and interviews that took place after the accreditation review.*

I. Introduction

The Engineering Graphics and Design Technology (EGR) program at western Michigan University went through the accreditation process under the new Technology Accreditation Commission (TAC) of ABET guidelines in 2005. Accreditation is always a daunting task, but the value of being accredited is undeniable. Students have been denied employment based on the fact that they came from unaccredited programs. Thus, the department took the task very seriously from the start.

The department began by hiring a consultant for external assessment of the program. Members of the faculty attended ABET workshops and participated as ABET reviewers to observe the process at other schools. Many meetings were held, and notebooks were assembled to present the materials that addressed each of the a-through-k criteria used by ABET for assessment (TAC, 2003). No one would say that the process did not have its problems, but the end result was that the program was one of four out of 17 programs that were successfully accredited in the College of Engineering and Applied Sciences.

With the 2006 accreditation effort done, the department began to assess the effort and prepare for the next accreditation cycle. This paper follows the assessment process of meetings, surveys, and interviews that took place after the accreditation review.

II. Process Assessment

The accreditation process was addressed as part of numerous departmental meetings and as the primary topic of three departmental retreats over a two year period. Much material had been assembled in 2005, but many questioned its effectiveness. A senior exit interview had been in effect for

assessment of the program along with alumni follow-up, but it could be improved. There was a need for a more effective way to collect evaluation material for courses each semester.

One plan at this point is to develop evidentiary materials in a much more compact fashion. This is being done by identifying courses that address each ABET area of concern to allow the material to be collected more easily and allow the reviewers to find it faster.

The senior exit interviews are continuing. The alumni and employer process has been streamlined with a much shorter online form. The intent is to keep the interviewees attention long enough to fill out the form.

Data for course review is now collected on a much simplified form. The form focuses on the review criteria that each course addresses. An instructor no longer has to wonder if items a-through-k must be addressed. So far the data seems to be coming in faster and more smoothly than before.

III. Curriculum Change Input

The input for curriculum change comes from many sources: ABET reviewers, faculty, Industrial Advisory Board (IAB) members, alumni, and students. ABET reviewers observed that the EGR program had similarities to other programs. Most of these occur in the first two years. ABET reviewers also suggested that the program needed more design content.

Many EGR and other technology students are involved in multidisciplinary teams for senior projects. It was judged that students did not possess the requisite skills expected in electronics. This became evident when students were tested on their incoming knowledge. These skills included knowledge of Programmable Logic Controllers, basic motor functions, hands-on trouble shooting of circuits, and soldering. Students studied Geometric Dimensioning and Tolerancing (GD&T) (IME 3480) in their junior year and then attempted to apply it in the senior year during their Metrology course (IME 4810). Professors acted on repeated student suggestions that the subjects should be taught together. The solution was to make IME 3480 and IME 4810 co-requisites, which also required a number change to IME 4810 to IME 3540. Following consultation with several alumni involved in product tolerancing, a series of concurrent assignments are under development to apply GD&T to a product and its verification. Objectives have been rewritten for both courses and a new coordinated outcome assessment is under development to verify the affect on student learning.

Students asked for earlier introduction to the design process. They also asked if the term "graphics" could be dropped from the degree name. Several students had reported having to explain past the word "graphics" in interviews or removing the word from their resume's to get past human resources. IAB members and alumni asked for its removal also.

The most extreme case of the human resource problem came when a local company had asked for resume's from EGR students. The top student in the program applied and was never called. Weeks later, a manager called and asked why he had not seen any applications. When he was told who had applied, the problem with human resources was corrected. The student got the job, but she should not have had to wait.

IAB members seemed to be fairly satisfied with the program. They like the mechanical engineering technology skills with a strong emphasis on Computer Aided Design and Computer Aided Engineering tools. The most common requests were

more emphasis on GD&T, Design for Manufacturability and Assembly, and Failure Modes and Effects Analysis (FMEA).

One more source driving change came from the software that handles the administration of classes and schedules. The EGR program offers students to use approved electives to establish areas of specialization called options. The administration software had no convenient way of dealing with these options of which there were four. The result was that the BANNER administration software made each option look like a separate degree. Thus, there was the basic EGR degree, the preprograms and four other EGR degrees related to each option. In times of economic stress, dividing the enrollment across the "options" marks a program for elimination since its elimination would remove six seemingly tiny degrees. It always floats the program to the top of the administration's list. This made minors an attractive solution. Minors would require more hours than an option, but the administration software does not treat them as separate four year degrees.

The department had the established the need to change the degree. What followed were the proposals, discussions, and meetings. Years of input from students and employers through program board meetings were used as the basis of nine months of departmental debate on how to deliver an improved program.

IV. Results of the Process

Several changes are reflected in the degree as shown in Figure 1. Two new design courses were added which serve to introduce the design process earlier in the program and address the ABET Criterion 3-d, 3-h, and 3-i program outcomes more effectively. They also bring the program into tighter alignment with the program criteria for Design Engineering Technology Programs (2007).

An approved elective was added to encourage students to pursue a minor. The number of hours in the program was reduced from 127 to 124, the TAC/ABET minimum. An electronics course with a hands-on focus replaced two existing electronics courses. Laboratories have added to the fluids and thermodynamics course. The curriculum was balanced to a maximum of 16 hours in any semester. Three technical minors were created to replace options. These are Minors in Automotive Technology, Cast Metals Technology, and Plastics Technology. A Minor in Engineering Design Technology is being studied for students in other curricula. The GD&T and Metrology classes were fully coordinated and made into co-requisites. Community colleges have been brought into the process so that they could design Associates degrees that dovetail with the program. The name of the program was changed from Engineering Graphics and Design Technology to Engineering Design Technology.

It should be noted that the reduction in hours came primarily from two sources. A course in general statistics was replaced by a statistics course more aligned with engineering and technology curricula resulting in a one hour reduction. A four hour course in programming was replaced by a one hour course in spreadsheet analysis and a one hour course in C++ programming. Over the last two years, several students were allowed to take the one hour course as a prerequisite for a later CAD programming course. These students have come in with the requisite skills. The addition of the spreadsheet skills seems to be a net plus.

Changes are usually gauged by the responses to them. To this point the responses have been very positive. Students are excited about the new program. They are already being allowed to take the minors and many have done so. The only negative comment has been that the alumni wish that the program had been available to them.

IAB members have responded positively as well. One member responded with the following:

" It seems the program has been updated to keep up with the ever changing industry. The additions of the design classes in the freshman and senior year are in line with the push we are seeing in the industry for 'Design Engineers'."

Name_____ WIN No._____

WESTERN MICHIGAN UNIVERSITY
Department of Industrial & Manufacturing Engineering
ENGINEERING DESIGN TECHNOLOGY (EDT) - Bachelor of Science Degree
2010-2011 Catalog

Grade/ Trans.	Semester/ Course			
		SEMESTER I - FALL		
____	____	*IME 1020 Technical Communication (Prof. 1)*	*3*	
____	____	IME 1420 Engineering Graphics	3	
____	____	IME 1500 Intro to Manufacturing (AREA VII)	3	
____	____	IME 1430 Product Design Fundamentals	3	
____	____	MATH 1220 Calculus I (or Math 1700) (Prof. 3)	4	
			16	
		SEMESTER II - SPRING		
____	____	*CHEM 1100 General Chemistry I (AREA VI)*	*3*	
____	____	*CHEM 1110 General Chemistry I Lab (AREA VI)*	*1*	
____	____	*MATH 1230 Calculus II (Prof. 4)(or MATH 1710)*	*4*	
____	____	PHYS 1130 General Physics I (AREA VI)	4	
____	____	PHYS 1140 General Physics I Lab (AREA VI)	1	
____	____	IME 1440 Descriptive Geometry	3	
			16	
		SEMESTER III - FALL		
____	____	IME 2540 Machining Processes	3	
____	____	*IME 2460 Computer-Aided Design*	*3*	
____	____	CS 1021 Intro. Engr. Comp I: Spreadsheets	1	
____	____	CS 1023 Intro. Engr. Comp III: Comp. Prog.	1	
____	____	*IME 2610 Engineering Statistics*	*3*	
____	____	*PHYS 1150 General Physics II*	*4*	
____	____	*PHYS 1160 General Physics II Lab*	*1*	
			16	
		SEMESTER IV - SPRING		
____	____	IME 2500 Plastics Properties & Processing	3	
____	____	IME 2810 Statics & Strength of Materials	4	
____	____	IME 3020 Engr. Teams:Theory & Pract.(AREA V)	3	
____	____	IME 2100 Applied Electricity/Electronics	3	
____	____	ME 2500 Material Science	3	
			16	

Grade/ Trans.	Semester/ Course		
		SEMESTER V - FALL	
____	____	IME 2830 Thermodynamics	2
____	____	IME 3460 Programming/Computer-Aided Design	3
____	____	IME 3480 Design for Production	3
____	____	IME 3540 Metrology	3
____	____	_____ Approved Elective	3
____	____	AREA VIII Health & Well-Being	2
			16
		SEMESTER VI - SPRING	
____	____	IME 3200 Engineering Cost Analysis	3
____	____	IME 3840 Fluid Mechanics & Hydraulics	3
____	____	IME 3440 Product & Machine Design	3
____	____	IME 4460 CAD Applications	3
____	____	_____ Approved Elective	3
			15
		SEMESTER VII - FALL	
____	____	IME 4480 Computer-Aided Analysis	3
____	____	IME 4490 Advanced Product and System Design	3
____	____	IME 4910 Multidisciplinary Sr. Proposal (Prof. 2)	2
____	____	_____ Approved Elective	3
____	____	AREA I* Fine Arts	3
			14
		SEMESTER VIII - SPRING	
____	____	IME 4920 Multidisciplinary Sr. Project (Prof. 2)	2
____	____	IME 4930 Multidisciplinary Sr. Proj. Consultation	1
____	____	_____ Approved Elective	3
____	____	AREA II* Humanities	3
____	____	AREA III* United States: Cultures & Issues	3
____	____	AREA IV* Other Cultures & Civilizations	3
			15

TOTAL →124

*** At least one of these courses must be at the 3000-4000 level**

NOTE: *A grade of "C" or better in gate courses (indicated in italicized type) is required for enrollment in upper division courses offered by the Department of Industrial & Manufacturing Engineering.*

Accepted for upper division courses:

_____ _____
Advisor's signature **Date**

Figure 1 The 124 hour curriculum.

Finally, the faculty are excited and energized. They are looking forward to teaching courses that they have fought long and hard for.

V. Conclusions

It is expected that these changes will enable our students to graduate with outstanding skills in design and virtual prototyping. It is also expected that students will be able to graduate in less time and with less expense. The new design courses should provide better skills in conceptual product design, product life cycle. and product analysis. It is expected that the move to Engineering Design Technology will better reflect our graduates' skill set and should aid in their employment.

VI. References

Technology Accreditation Commission (2003), *2004-2005 Criteria for Accrediting Engineering Technology Programs*, www.abet.org

Technology Accreditation Commission (2007), *2008-2009 Criteria for Accrediting Engineering Technology Programs*, www.abet.org