

Undergraduate Curriculum Committee Summer Meeting Report

August 12, 2016

Agenda:

- 1) Continuous Improvement
- 2) Altering the aerospace emphasis
- 3) Labs
- 4) Freshman Intro to ME
- 5) UGC Meeting Schedule

Minutes

1) Continuous Improvement (ABET Criterion 4)

“The program must regularly use appropriate, documented processes for assessing and evaluating the extent to which the student outcomes are being attained. The results of these evaluations must be systematically utilized as input for the continuous improvement of the program.” ABET 2016-2016 General Criterion 4. Continuous Improvement

“There must be a documented, systematically utilized, and effective process, involving program constituencies, for the periodic review of these program educational objectives that ensures they remain consistent with the institutional mission, the program’s constituents’ needs, and these criteria.” ABET 2016-2016 General Criterion 2. Program Educational Objectives

Assessment

Assessment – Assessment is one or more processes that identify, collect, and prepare data to evaluate the attainment of student outcomes. Effective assessment uses relevant direct, indirect, quantitative and qualitative measures as appropriate to the outcome being measured.

Appropriate sampling methods may be used as part of an assessment process.

The MAE department gathers assessment data from the following sources involving program constituencies, students (freshman-seniors and exiting seniors), post-graduate constituents (industrial advisory board, FE results), and course instructors.

- 1) Industrial Advisory Board
- 2) Student Exit Interviews and Exiting Student Surveys
- 3) Evaluations of Student Outcomes by Instructors of Courses
- 4) Student Assessments on Student Outcomes on IDEA Surveys
- 5) Fundamentals of Engineering Results 2015-2016

The full assessment results are contained in the *ABET 2015-2016 Academic Year Binder* and in the ABET folder on the USU BOX site. This includes the results of the surveys and the response of the industrial advisory board.

Student work for required courses, including Capstone Design Reports, are collected to demonstrate the degree that student outcomes are being met and to provide evidence of program weaknesses. This data is currently stored on the USU BOX account.

Evaluation

Evaluation – Evaluation is one or more processes for interpreting the data and evidence accumulated through assessment processes. Evaluation determines the extent to which student outcomes are being attained. Evaluation results in decisions and actions regarding program improvement.

A scale of 1-5 is used for evaluation of the data. The interpretation of evaluation is contained in Table 1.

Table 1 Equivalence of Evaluation Definitions

Numerical Score	Grade	Description	Questionnaire's: I can meet the following criterion ...	MAE FE average percentile in comparison to national average
5	A	Outcome criterion is strongly met	Strongly Agree	MAE > 70 th
4	B	Outcome criterion is satisfactory met	Agree	70 th > MAE > 60 th
3	C	Outcome criterion is adequately met	Neutral	60 th > MAE > 50 th
2	D	Outcome criterion is poorly met	Disagree	50 th > MAE > 40 th
1	F	Outcome criterion is not met	Strongly Disagree	40 th > MAE > 30 th
0	I	Outcome criterion cannot be determined		

Assessment values of less than 3 from any of the program constituencies and recommendations from the industrial advisory board, student comments from exit interviews, and faculty insights were all considered in the Program Evaluation by the undergraduate curriculum committee (UGC). Table 2 summarizes the areas that are currently being evaluated and the actions recommended by the UGC.

Table 2 Summary of Evaluation of Assessment Data

Industrial Advisory Board			
Description of Concern	Score or Reason for Concern	Recommended Action	Proposed Evaluation of Action
Improve cross-pollination with other engineering disciplines.	Recommendation from Advisory Board	Consult with College Academic Dean	Review progress in January 2017
Emphasize project-type work in the undergraduate curriculum.	Recommendation from Advisory Board	Address in MAE faculty retreat. Evaluate and report what faculty are currently doing.	Review data from faculty in January 2017 meeting.
Addition of an Aerospace Structures course to the aerospace program.	Recommendation from Advisory Board	Consult with faculty. May be part of new Aerospace Structures option in Aero emphasis	Re-evaluate in January 2017 meeting.
Establish an industry cooperative agreement program.	Recommendation from Advisory Board	Prepae recommendations for the MAE Fall retreat.	Re-evaluate in January 2017 meeting.

Student Exit Interviews and Exiting Student Surveys			
Description of Concern	Score or Reason for Concern	Recommended Action	Proposed Evaluation of Action
Advising with respect to career planning.	2.42 Fall 2.53 Spring	Review options including Intro to MAE Course topic	Evaluate progress at January 2017 meeting.
Instruction in manufacturing	2.73 Fall 2.81 Spring	Develop proposal for lab courses that includes a mfg. lab	Evaluate progress at January 2017 meeting.

Student Assessments on Student Outcomes on IDEA Surveys			
Description of Concern	Score or Reason for Concern	Recommended Action	Proposed Evaluation of Action
None	No scores were below 3.0		

Evaluations of Student Outcomes by Instructors of Courses			
Description of Concern	Score or Reason for Concern	Recommended Action	Proposed Evaluation of Action
3a3: Students understand alternate approaches to solving engineering problems, in order to help choose an effective approach.	< 3.0 in Spring 2016 Heat Transfer Course	Address in Fall 2016 Retreat	Evaluate progress at January 2017 meeting.
3b3: Uses appropriate tools to analyze data and verifies and validates experimental results including the use of statistics to account for possible experimental error.	< 3.0 in Fall 2015 Material Science Lab	Address in lab review. Review the statistics and probability being taught in the MAE courses.	Evaluate progress at January 2017 meeting.
3g1: Students apply the correct technical style and format appropriate for the audience.	Below 3.0 Fall 2015	Faculty of courses requiring reports have developed a template for reports that will be forwarded to the ENGR 3080 technical writing coordinator.	Evaluate progress at January 2017 meeting.

Fundamentals of Engineering Results 2015-2016			
Description of Concern	Score or Reason for Concern	Recommended Action	Proposed Evaluation of Action
Engineering Economics	Department average was below national average	Evaluate with Instructors	Evaluate progress at January 2017 meeting.

Evaluation of the Effects of Previous Improvements

Areas of concern that have been noted and addressed this past year include.

- Reduction in class size.
- Improving capstone experience
- Introduction to Engineering Course
- Increase Instruction in Design and Manufacturing

A summary of the changes that have been made and evaluation of their effectiveness follows.

Evaluation of Reduction in Class Size

This has been difficult to accomplish. Initiatives that have been proposed and attempted include, offering multiple sections of courses different terms, offering multiple sections of courses the same term, increasing the entrance requirements into the professional program and increasing the entrance requirements into the MAE program as a freshman.

Table 3 shows the courses in the professional program not including the general education courses. The courses highlighted in blue are taught multiple semesters or have multiple sections in the specified term. Offering multiple sections of professional level courses different terms has been attempted with MAE 4300 Machine Design and MAE 3600 Professionalism. In both instances the number of the students in the new sections were too small to justify the course. Splitting the Capstone Design courses has been very effective. It appears that unless more junior level courses can be split, students are not able to take advantage of courses that are not in the sequence represented on the 4-year plan.

Courses with multiple sections taught the same term has been very helpful in reducing the course size. Specifically, MAE 3040 was taught in 2 sections this year.

Table 3 Professional Program Courses.

Number	Title	Credits	Term	Number	Title	Credits	Term
CS 1400	Computer Science I	3	F/Sp/Su	MAE 3210	Numerical Methods	3	Sp
CS 1405	Computer Science I Lab	1	F/Sp/Su	MAE 4300	Machine Design	3	Sp
ENGR 3080	Technical Communications	3	F/Sp	MAE 3440	Heat & Mass Transfer	3	Sp
MAE 3040	Mechanics of Solids	3	F	MAE 3340	Instr. & Measurements	3	Sp
MAE 3420	Fluid Dynamics	3	F	Gen Ed	Breadth	3	F/Sp
MAE 3320	Advanced Dynamics	3	F			15	
MAE 3600	Professionalism	1	F/Sp				

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Number	Title	Credits	Term	Number	Title	Credits	Term
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MAE 4400	Fluids/Thermal Lab	2	F/Sp
MAE 4800	Capstone Design I	3	F/Sp
MAE 5300	Vibrations	3	F
Tech Elective		3	F/Sp
Tech Elective		3	F/Sp
Gen Ed	Breadth	3	F/Sp

MAE 4810	Capstone II	3	F/Sp
Tech Elect		3	F/Sp
Tech Elect		3	F/Sp
Gen Ed	Depth	3	F/Sp
Gen Ed	Depth	3	F/Sp

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The entrance requirements the professional program were increased from 2.2 GPA to 2.8 GPA 5 years ago. It has been very difficult to assess the impact of this change. The entrance requirements into the MAE program as a freshman went into effect the fall of 2014. The required entrance index went from 90 to 110. Data from the dean's office for the fall of 2013 and 2015 show the change in the number of freshman students accepted and enrolled as shown in Table 4 and repeated in Fig. 1.

Table 4. Freshman Applying and Enrolled in the MAE program Fall 2013 and 2015

	Applied			Enrolled		
	2013	2015	Change	2013	2015	Change
Grad +1	28	110	82	20	63	43
New Freshman	356	300	-56	139	89	-50
Transfer	59	63	4	42	37	-5
Other	30	18	-12	18	14	-4
Total	473	491	18	219	203	-16

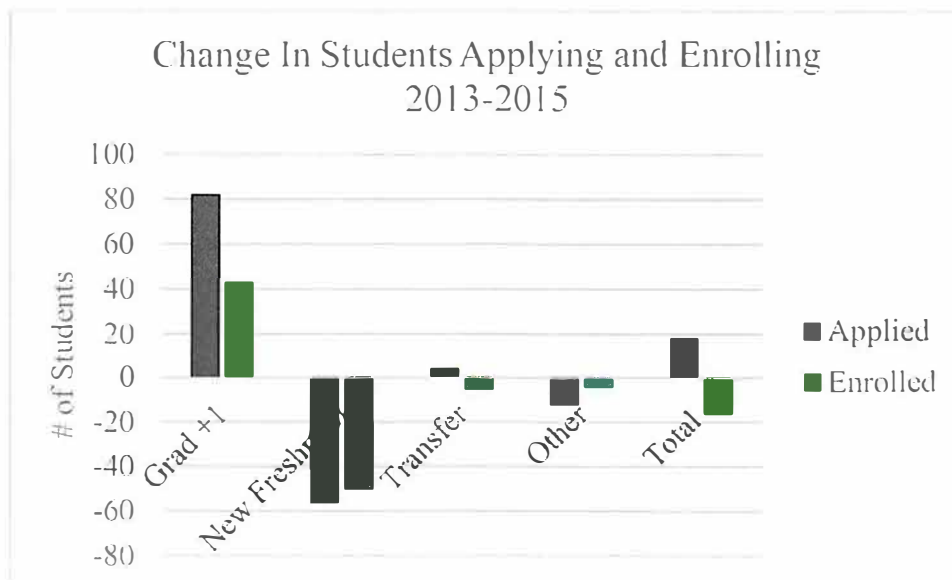


Fig. 1 Freshman Applying and Enrolled in the MAE program Fall 2013 and 2015

The categories are Grad +1, students that have been out of high school at least a year and are now applying to the MAE program, New Freshman, students that graduated the past spring, transfer students that have attended other post-secondary schools, and students that do not fit any of these descriptions.

More students applied in 2015 (18 more than 2013), and 16 fewer were accepted in 2015 than were in 2013. This does not represent a dramatic decrease ($\Delta=-7.3\%$), however it is in the right direction. More interesting is the average admission index of the two groups. The average admission index of the students enrolled in 2013 was 116.3 and in 2015 the average admission index was 122.6. The students accepted in the department as freshman are fewer and have a greater potential as indicated by their scores. Fig. 2 shows the percentage of students enrolled that have achieved the indicated admission index for 2013 and 2015. The higher required admission index is eliminating students with lower grades and ACT scores but not allowing them to be admitted or discouraging them from applying.

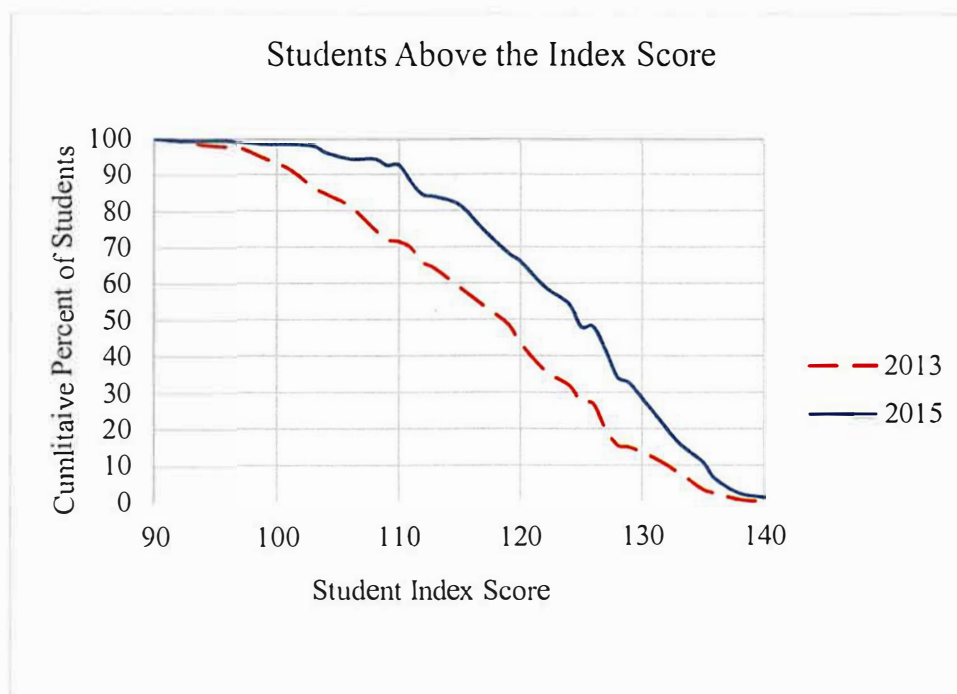


Fig. 2 Percentage of Students Enrolled that have Achieved the Indicated Admission Index

Note there are some student that are enrolled that are below the 110 index in 2015. Apparently some had previously applied and are grandfathered under the old index. We would expect that in the future no students will enter as freshman below the 100 admission index.

Improving Capstone Experience

Students and Industrial Advisory Board Members pointed out the need for an improved Capstone Design experience. Tremendous efforts have been made in the past resulting in quality projects and national contest victories. Two Professors of Practice to replace research faculty teaching the course were found from a national search. Both have industrial experience, earned M.S. in engineering, relate well to the students, are organized, and are enthusiastic about

the job. They are emphasizing national competition design teams, e.g., SAE mini-baja, AIAA Design, Build & Fly, ASME human-powered vehicle. Initial response from the students, faculty and advisory board have been very positive.

Introduction to Engineering Course

A faculty member has been researching an introduction to mechanical engineering course and has proposed a syllabus. They will present this at the fall retreat 2016. The department responded to a university request for proposals to develop this course. We would like to implement the course by Fall 2017. We still need to find the credit to put in the curriculum for the course.

Increase Instruction in Design and Manufacturing

One of the new professor of practice faculty has increased our abilities to teach the geometric dimensioning and tolerancing in the engineering graphics course. Students have been very pleased with this instruction and the shift to Solid Works software. A strategic plan for the labs which would include a manufacturing lab is also in development. We realize that this are first steps and the department would benefit from further additions to curriculum in manufacturing. We are recommending the addition of a technical course in manufacturing processes as the next priority.

2) Altering the Aerospace Emphasis

The proposal made by faculty at the Spring UGC meeting was unanimously approved. The proposal is to add an aerospace structures option to the aerospace emphasis. Input from the aerospace faculty was requested and appears to be in favor. A full vote of the faculty will be taken at the fall retreat.

3) Strategic Plan for Labs

Faculty reviewed an outline for a strategic plan for the labs. More detail and plans will be made on how to adopt the suggestions. The plan involves combining the instrumentation lab with the materials lab and adding labs in dynamics and controls and in manufacturing.

4) Introduction to Engineering Course

Faculty presented a syllabus for the introduction to engineering course which was approved by the committee with a few changes. The syllabus will be presented to the faculty at the fall retreat. Faculty will review options for getting the credits for the course.

5) UGC Meetings

The UGC will meet January, May and August in the future. Ad hoc meetings may be held in between.

6) Other Items

Faculty will identify how/if students are learning a little probability theory (in addition to statistics), as this is required for the FE exams.