AY 2024 Continuous Curriculum Improvement Summary

MAE Fall Retreat

8/23/2023

Utah State University®

MECHANICAL AND AEROSPACE ENGINEERING

Outline

1. Where we are in the Continuous Improvement cycle.
2. Data collection courses
3. Changes to Program/Courses based on last assessment data
4. Recent ABET changes and what they mean for us – we may need to change where and how we perform several SO assessments

CCIC Cycle Schedule

Activity	Cycle 1		Cycle 2		Cycle 3	
	AY21	AY22	AY23	AY24	AY25	AY26
Review of MS, PEOs, PIs	X		X		X	
Map educational strategies related to PIs	X				X	
Review mapping and identify where data will be collected	X				X	
Develop and/or review assessment methods used to assess PIs	X				X	
Collect data*		X		X		X
Evaluate assessment data including processes		X		X		X
Report findings		X		X		X
Take action where necessary			X		X	

Instructor Course Assessment Schedule

Course	AY 2021		AY 2022		AY 2023		AY 2024		AY 2025		AY 2026	
	F20	S21	F21	S22	F22	S23	F23	S24	F24	S25	F25	S26
MAE 1010*				■				■				■
MAE 3040**			■				■				■	
ENGR 3080*			■				■				■	
MAE 3340*				■				■				■
MAE 3420**			■				■				■	
MAE 3440**				■				■				■
MAE 3600			■				■				■	
MAE 4300				■				■				■
MAE 4400*			■				■				■	
MAE 4800/4810				■				■				■

■	indicates the semester in which student work is collected and instructor assessments are completed on that work using the rubrics
*	courses taught both semester only need to perform assessments in a single semester during the assessment periods
**	courses that offer multiple sections only need to perform assessments on a single section

Summary of AY 2023 Actions

- Action was required for SO 2 (Design), SO 4 (Informed Judgment), and SO 7 (Lifelong Learning)
- Design?
- Informed Judgment?
- Lifelong Learning?

ABET ASME Mechanical Engineering Program Criteria Clarifications

- Requires substantial coursework in Thermal and Mechanical Systems

- Requires significant design experience in Thermal OR Mechanical Systems

Recent ABET Changes

SO1: Complex Problems: programs need to demonstrate ability to solve; complexity defined **(MAE 3420 and 3440)**

SO2: Engineering Design: list of factors that must be considered – even if all factors do not influence design and addition of consideration or risk **(MAE 3340 and 4800/4810)**

SO3: Communication: each program must determine "range of audiences" **(ENGR 3080 and MAE 4400)**

SO4: Responsibilities: judgments must consider impact in all: global, economic, environmental and societal contexts **(MAE 1010, 3600 and 4800/4810)**

Recent ABET Changes

SO5: Teams: inclusiveness must be defined, and project (task) management demonstrated **(MAE 3340 and 4800/4810)**

SO6: Experimentation: no requirement to design experiments, but must show use of judgment in drawing conclusions **(MAE 3340 and 4400)**

SO7: New Knowledge: broad; such as identifying needed information, reviewing literature and information, using appropriate sources, applying information **(MAE 3040 and 4300?)**

Complex Engineering Problems - Definition

Complex engineering problems include **one or more** of the following characteristics: ***involving wide-ranging or conflicting technical issues, having no obvious solution, addressing problems not encompassed by current standards and codes, involving diverse groups of stakeholders, including many component parts or sub-problems, involving multiple disciplines, or having significant consequences in a range of contexts.***

Student Outcome 1 (Problem Solving) PIs

(SO 1 Problem Solving) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

a. Students interpret given information and correctly identify the problem to be solved.
b. Students apply scientific and engineering principles that are appropriate for the required accuracy to formulate mathematical models of systems and/or processes.
c. Students apply mathematical principles to obtain analytical or numerical solutions of mathematical models with the required accuracy, including the use of computer-based tools.

Student Outcome 1 (Problem Solving) PIs

We currently assess these PIs in MAE 3420 and 3440 and the FE Exam

AY2022 showed a very high level of attainment in 3420 and 3440 as did the FE Exam results, but these problems were/are not “complex”

Consider using problems that match the ABET definition of “Complex”

Student Outcome 2 (Design) PIs

(SO 2 Design) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

a. Students produce clear and concise problem statements for design problems.
b. Students identify realistic requirements and constraints through consideration of appropriate professional standards; public health, safety, and welfare; and global, cultural, social, environmental, and economic factors.
c. Students develop multiple design alternatives and use requirements and constraints to evaluate acceptability and desirability in an objective fashion.
d. Students apply appropriate engineering principles to design and evaluate systems, components, and/or processes to manage risks while meeting design requirements and constraints.

Student Outcome 2 (Design)

- Need to make sure we are considering all factors (global, cultural, social, environmental and economic) even if they do not influence the design
- Consideration of Risk
- Use of appropriate standards

Student Outcome 3 (Communication) PIs

(SO 3 Communication) an ability to communicate effectively with a range of audiences

a. Students produce clear, complete, and accurate technical graphics.
b. Students write effectively on engineering topics using a format and level of detail that is appropriate for the intended audience.
c. Students prepare and give effective oral presentations on engineering topics using a format and level of detail that is appropriate for the intended audience.

Student Outcome 3 (Communication)

- What is our students' "range of audiences?"
  - Technical, Managerial, Lay person?
- Our current assignment rubrics do not independently assess graphics. Should we include this in the written and oral communication Performance Indicators?

a. Students write effectively on engineering topics using appropriate graphics, format, and level of detail that is appropriate for the intended audience.

b. Students prepare and give effective oral presentations on engineering topics using appropriate graphics, format, and level of detail that is appropriate for the intended audience.

Student Outcome 4 (Informed Judgment) PIs

(SO 4 Informed Judgment) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

a. Students understand and evaluate ethical and professional dimensions in engineering situations by applying the ASME Code of Ethics of Engineers.
b. Students understand and evaluate the global and local impact engineering solutions have on the economy, the environment, and society.

Student Outcome 4 (Informed Judgment)

Are we considering the impact of engineering solutions in global, economic, environmental, and societal contexts?

Student Outcome 5 (Teamwork) PIs

(SO 5 Team Work) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

a. Students act professionally in a team setting by defining mutually agreed upon team roles and by fostering a collaborative and inclusive environment.
b. Students work together to establish goals and plan tasks to meet project objectives.

Student Outcome 5 (Teamwork)

Team (ABET Definition)

A team consists of more than one person working toward a common goal and should include individuals of diverse backgrounds, skills, or perspectives.

How are students demonstrating project/task management?

Student Outcome 6 (Experiments) PIs

(SO 6 Experiments) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

a. Students develop appropriate experimental procedures for obtaining measurements of a desired variable.
b. Students conduct experiments by following experimental procedures and operating instrumentation in a manner appropriate for the required accuracy.
c. Students compare experimental results with appropriate models; explain differences between experimental results and model results, including measurement uncertainty; and develop meaningful conclusions.

Student Outcome 6 (Experiments)

Should we update the Performance Indicators for SO 6?

Student Outcome 7 (Lifelong Learning) PIs

(SO 7 Lifelong Learning) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

a. Students recognize gaps in their skills and knowledge.
b. Students acquire reliable resources to supplement their skills and knowledge.
c. Students apply new skills and knowledge to an engineering problem in an independent or unstructured setting.

Student Outcome 7 (Lifelong Learning)

- This outcome may be better assessed using survey questions instead of instructor assessments in MAE 3040 and 4300.
- Most surveys are indirect measures, but specific survey questions on graduate school and/or professional plans and memberships of student organizations are considered “facts” rather than “opinions.”
- Potential Survey Questions*:

1. Do you plan to attend graduate or professional school?
2. Do you plan to pursue professional licensure?
3. Are you a member of a student organization?
4. Do you plan to be a member of a professional organization?

**Target responses would need to be determined*