

## **Meaning, Quality, and Integrity Degree Statement for Mechanical Engineering Program**

The Mechanical Engineering Department offers one undergraduate degree: Bachelor of Science in Mechanical Engineering. The program is accredited by the Engineering Accreditation Commission of ABET. In accordance, it must satisfy *General Criteria for Baccalaureate Level Programs* (Criteria 1-8). Additionally each accredited program must satisfy so called *Program Criteria* to ensure academic rigor specific to particular disciplines. Throughout this document we will make specific references to Criteria set forth by ABET: this will be the General Criteria.

### **Meaning: Structure of the degree, components, and its expectations.**

#### **Generic degree and what makes it distinct**

What makes our degree unique is the “learn-by-doing” approach and our emphasis on our graduates immediately working after graduation as a functioning mechanical engineer or enter graduate school. Our degree is broad as the curriculum covers a multitude of disciplines, and our faculty comes from a broad range of knowledge base, with a large percentage with working experiences in the industry, are available to maintain such a curriculum.

#### **Mission and Program Educational Objectives Alignment with the University vision, values and outcomes.**

The mission of the Cal Poly Pomona College of Engineering and our department, as part, is to produce well-qualified engineering graduates who are ready for immediate and productive entry into the workforce or for graduate studies. Our department does so by providing practice-oriented education based on sound engineering principles and applications, while also emphasizing the teamwork, communication and creative skills needed to be leaders in a global society.

The Mechanical Engineering program's mission is to provide a quality, well-rounded education that is based on imparting fundamental knowledge and skills in mathematics and pure sciences as well as engineering science and design, and to prepare graduates who will be effective contributors to the Mechanical Engineering profession within a short time after their graduation.

Our department strives to be a leader in providing relevant and rigorous engineering education in a learning-centered environment. As such, we offer programs and curricula that are up-to-date, globally competitive, and supported by strong ties to educational and industrial partners, while maintaining a community of students, staff, and faculty who are talented, successful, and reflect the diversity of California.

Our program is accredited by the Engineering Accreditation Commission of ABET and must satisfy Criterion 2: Program Educational Objectives of the *General Criteria for Baccalaureate Level Programs*:

*The program must have published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria. 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.*

In fulfillment, the ME department has adopted the following as its program educational objectives for its Mechanical Engineering program:

1. provide a solid background in mathematics and science coupled with an applications-oriented polytechnic approach in the presentation of engineering course material which may be synthesized over the first few years of one's engineering career
2. provide a comprehensive program of general education courses that will provide students with the necessary background to understand the economic, environmental, ethical, political, societal and cultural impact of their engineering solutions and decisions which may be implemented in ethical and professional situations soon after graduation
3. develop good written and verbal communication skills which will be used as a cornerstone in the early development years of a young engineer's career
4. encourage lifelong learning in their chosen field underscoring the importance to continue to obtain professional development and training on the job as needed during one's entire career
5. provide the necessary tools and background to become a professional engineer who will continue to be effective in the first few years of his/her professional assignment

### **Entering students and culminating abilities**

Entering students come in with a wide range of communication, teamwork, leadership, and technical skills ranging from very little to very significant. The earliest classes are designed to give students immediate opportunities for growth and development in these areas. From the very beginning students are expected to look at real companies and operations and begin to apply what they are learning. For example, in the introductory course *ME 233/L: Introduction to Design* students are assigned to build prototypes of multi-disciplinary design to practice design principles, creativity techniques and to develop concept design and evaluation. Intermediate courses continue to develop knowledge, skills, abilities, and attitudes. Later on, the culminating team senior project is a significant demonstration of their developed skills and abilities and demonstrates their preparedness for industry or graduate school.

### **Curricular and co-curricular components**

The curriculum is filled with laboratory work, team projects, and other hands-on learning experiences to help reinforce the knowledge and theory also taught. Students are active in the student chapters of the disciplines represented in our department, attend annual regional and national conferences, and participate successfully in student competitions. Guest speakers, field trips, student competitions, trade shows and other techniques are used to develop the student's ability to relate to and apply what they are learning in

the current environment. Most ME students experience one or more internships during their undergraduate years. Students are encouraged to participate in undergraduate research and can even work with a faculty member on a research-based senior project.

At the undergraduate level the emphasis is on developing basic skills and abilities. The goal is to provide students with experiences that bring them to a level of proficiency that will allow the function productively upon graduation.

### **Quality: Alignment of the degree program with expectations**

Our program is accredited by the Engineering Accreditation Commission of ABET. As such, our curriculum is designed to meet standards set forth by ABET including Program Criteria which describes sufficient courses in mathematics, basic sciences and engineering.

In addition to meeting curriculum requirements, we are required to have documented student outcomes that prepare graduates to attain the program educational objectives. As described by ABET in Criterion 1:

*Student performance must be evaluated. Student progress must be monitored to foster success in attaining student outcomes, thereby enabling graduates to attain program educational objectives. Students must be advised regarding curriculum and career matters.*

*The program must have and enforce policies for accepting both new and transfer students, awarding appropriate academic credit for courses taken at other institutions, and awarding appropriate academic credit for work in lieu of courses taken at the institution. The program must have and enforce procedures to ensure and document that students who graduate meet all graduation requirements.*

Our aforementioned Student Outcomes (Learning Outcomes) are specified by ABET's Criterion 3 and are as follows:

- a. an ability to apply knowledge of mathematics, science and engineering
- b. an ability to design and conduct experiments, as well as to analyze and interpret data
- c. 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
- d. an ability to function on multidisciplinary teams
- e. an ability to identify, formulate, and solve engineering problems
- f. an understanding of professional and ethical responsibility
- g. an ability to communicate effectively
- h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i. a recognition of the need for, and an ability to engage in life-long learning
- j. a knowledge of contemporary issues
- k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Describe learning outcomes, levels set for graduates, and expectations**

The following table shows the mapping between the ME program objectives and student learning outcomes. As seen below, the ME Student Outcomes are in accordance with the Program Objectives stated previously, and they also meet the requirements of Criterion II and Criterion III of **ABET** Criteria. Thus, if the student outcomes are satisfactorily demonstrated by ME students, the corresponding program objectives are achieved as well.

**Table 1: Mapping of Student Outcomes onto CPP ME Program Educational Objectives**

Program Educational Objectives	Program Educational Objective Statements	Student Outcomes used
1	provide a solid background in mathematics and science coupled with an applications-oriented polytechnic approach in the presentation of engineering course material which may be synthesized over the first few years of one’s engineering career	a, b, e
2	provide a comprehensive program of general education courses that will provide students with the necessary background to understand the economic, environmental, ethical, political, societal and cultural impact of their engineering solutions and decisions which may be implemented in ethical and professional situations soon after graduation	f, h, j
3	develop good written and verbal communication skills which will be used as a cornerstone in the early development years of a young engineer’s career	g
4	encourage lifelong learning in their chosen field underscoring the importance to continue to obtain professional development and training on the job as needed during one’s entire career	i
5	provide the necessary tools and background to become a professional engineer who will continue to be effective in the first few years of his/her professional assignment	a, b, c, d, e, k

**Describe how the curricular and co-curricular components of the program help students to meet the expectations and learning outcomes**

The following table shows the mapping between the ME curriculum and student learning outcomes. As seen below, the ME Student Outcomes are aligned with Mechanical Engineering curriculum. Therefore, the ME student Outcomes can be assessed based on the courses objectives of ME curriculum.

**Table 2: Mapping of CPP ME Student Outcomes onto ABET A-K Criteria**

Student Outcomes	ABET Criterion a-k	Courses in placed to satisfy the criteria
a	a	all MATH, PHYS and ME required and technical elective courses
b	b	ME220L,ME313L,ME350L,ME418/L,ME427, ME435/L,ME439/L,EGR481/482
c	c	ME218, ME219, ME233/L, ME302, ME312, ME315, ME325, ME340, ME350L, ME406/A, ME418/L, ME427, ME435/L, EGR481/482
d	d	ME100L, ME220L, ME224L, ME233/L, ME325/L, ME406/A, ME418/L, ME427, ME435/L, EGR481/482
e	e	All ME required and technical elective courses
f	f	EGR402, ME100L, ME325, ME418/L, ME427, ME435/L, EGR481/482, Upper Division Technical Electives
g	g	ME100L,ME220L, ME224L, ME233/L, ME313L, ME325/L, ME350L,ME406/A, ME418/L, ME427, ME435/L, ME439/L, EGR481/482
h	h	ME100L, ME302,ME312, ME325/L, ME415, ME418/L, ME427, ME435/L, EGR481/482, Upper Division Technical Electives
i	i	ME100L, ME302,ME312, ME325, ME415, ME418/L, ME427, ME435/L, EGR481/482, Upper Division Technical Electives
j	j	ME100L, ME302,ME312, ME325, ME406/A, ME415, ME418/L, ME427, ME435/L, EGR481/482, Upper Division Technical Electives
k	k	EGR402, EGR403,EGR481/482, all ME required and Upper Division Technical electives

**Integrity: Assurance that the degree is meeting expectations**

Our program is accredited by the Engineering Accreditation Commission of ABET which requires documented continuous improvement; described in 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. Other available information may also be used to assist in the continuous improvement of the program.*

To address Criterion 4, our department utilizes a variety of documented assessment instruments including standalone summative exams and formative exams. The results of the evaluations are used as input for continuous improvement of our program.

**Describe the assessment that is in place to insure curricular and co-curricular components are meeting their purposes, the extent to which the program is achieving expectations, and feedback collected internally and externally**

In addition to the meeting minutes, several metrics will be used in the assessment process. Survey forms act as a primary means by which to acquire data. These data allow the ME program to perform objective assessment and obtain much needed information in order to close the feedback loop of updating the curriculum. The following shows the assessment methods we use at this time.

Table 3: List of Assessment Methods

	Assessment Method
Direct Measurement	a. FE Exam
	b. GWT
Indirect Measurement	a. Course Notebook review by Course Coordinators
	b. Faculty Survey
	c. Alumni Survey Surveys
	d. Senior Surveys
	e. Portfolio of Senior Projects
	f. IAC Surveys
	g. Employer Survey
	h. Project Symposium
	i. Others

The effort involved in the assessment process at Cal Poly Pomona’s ME program culminates in the modification of the curriculum to attain meet to ME program educational objectives and student outcomes. Discussions and committee meetings will be held regularly during the academic year, with the main purpose of proposing and changing the ever evolving ME Department curriculum. Several committees serve to document the Assessment Process and to demonstrate that the program objectives have been attained. : i) MEIAC (Industrial Advisory Committee), ii) ME student forums, iii) ME Department meetings, iv) ME curriculum committee meetings, v) ME laboratory committee meetings. The assessment committee is in charge of generating/managing assessment tools and is also responsible for collection, compilation of data and dissemination of assessment results while the rest of the committees provide input and feedback and propose changes to the curriculum. Based on the student outcomes assessment

results, the ME faculty in department meeting discuss if the of our program educational objectives are satisfactorily met. If certain outcomes are not attained at the expected level, the ME faculty or the corresponding committees/ course coordinators will propose an improvement plan for course modification, as well as revise. Furthermore, all the ME faculty will review or modify the ME mission, program educational objectives and student learning based on all the inputs from ME constituents and assessment results for a better assessment. The following Figure shows how the assessment committee interacts with the rest of the stake holders to provide direct feedback.

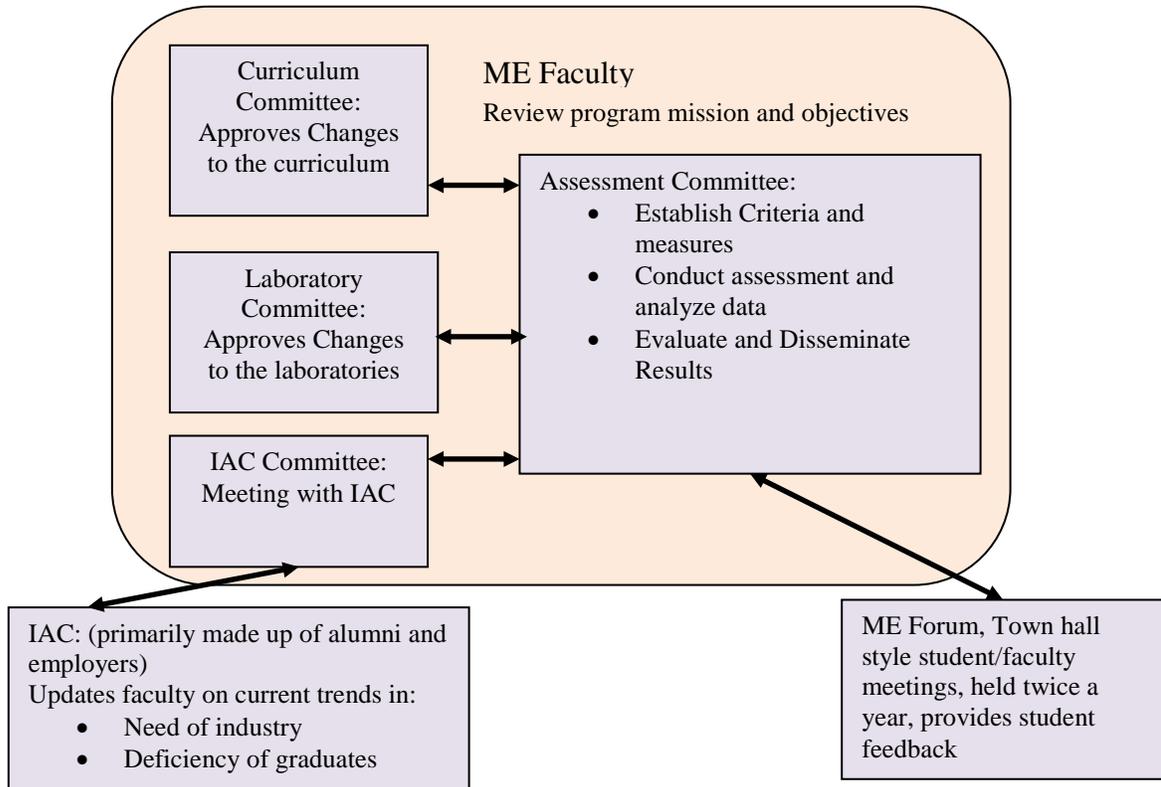


Figure 1: Interaction between Assessment Committee and Stakeholders