Mechanical Engineering

Program Improvement Plan

Edition 5.1

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CONTENTS

1. INTRODUCTION

1.1 Purpose of this Document

The purpose of this document is to outline a process for continuous assessment and improvement of the Mechanical Engineering Program. It is the primary repository of the Mechanical Engineering Program Mission and Vision Statements, Program Educational Objectives, and Program Outcomes. The process for achieving the Program Outcomes, procedures for assessing achievement of those Outcomes, and methods for maintaining and improving all the aforementioned are included. The implementation of these procedures will likely result in regular revision of this document.

1.2 Program Improvement Coordinator

The Department Chair, or his designee, is responsible for administering this plan as well as maintaining this document.

1.3 Assessment Cycle Timetable

Each academic year, a series of activities will be executed which are intended to lead to improvement in the Mechanical Engineering Program. Figure 1 describes the process and Figure 2 shows the timeline for assessment and program improvement. Table I summarizes when these activities will occur. More details are contained in subsequent sections.

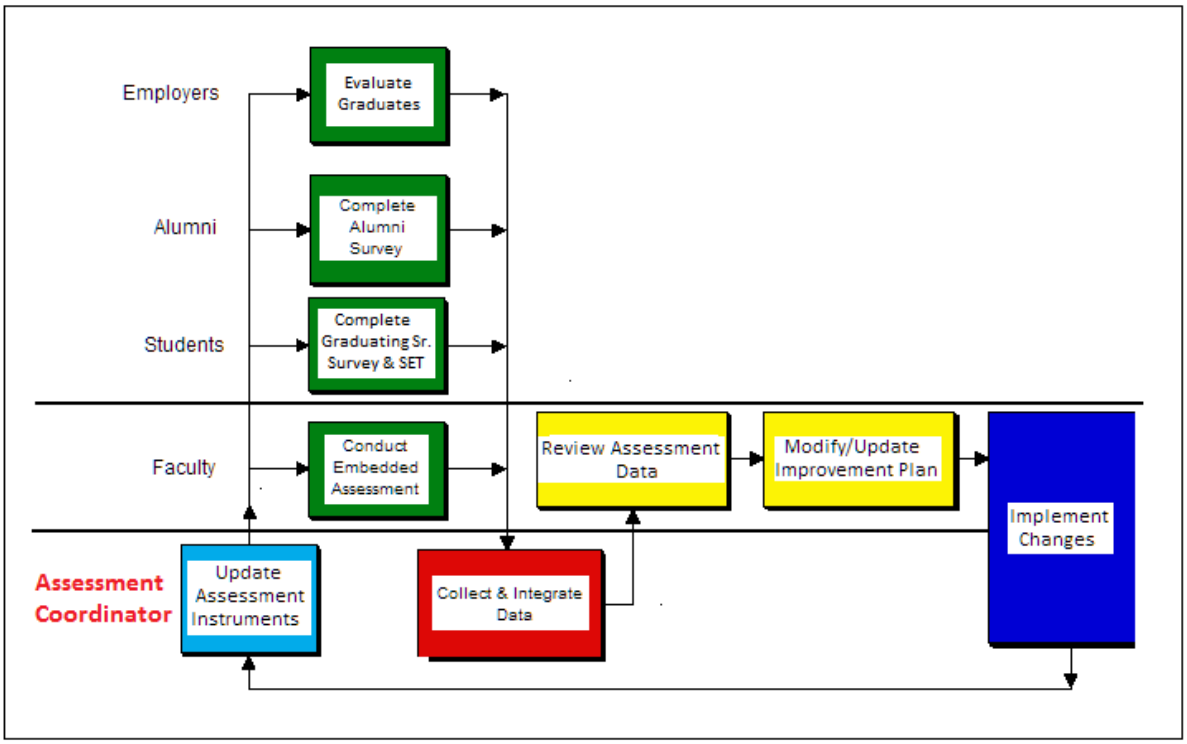

Figure 1: Program improvement process

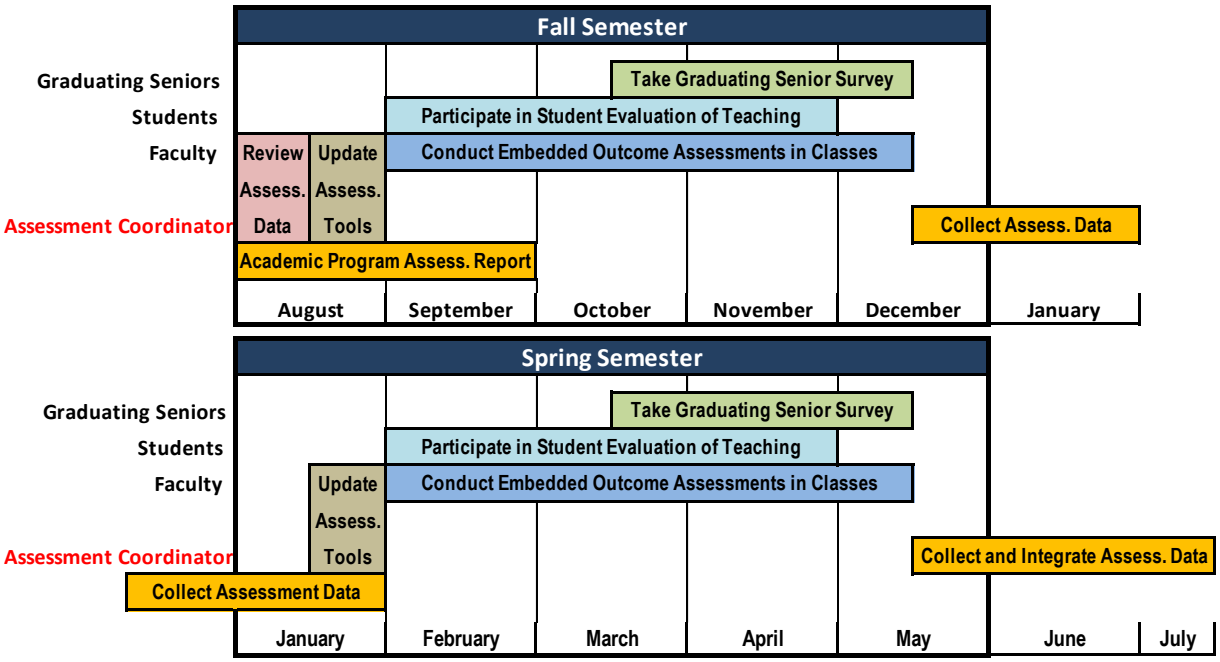

Figure 2: Timeline for the program improvement cycle

Table I: Timetable for Program Improvement Activities

Fall Semester			
	Deadline	**Responsible Party**	**Activity**
1	Thursday prior to first day of classes	Program Improvement Coordinator	Remind instructors of courses in which Program Outcomes are to be assessed in the fall semester Review ***Program Improvement Plan***
2	September 30	Program Improvement Coordinator	Submit ***Annual Program Improvement Report*** to Dean
3	October 31	Department Faculty	Faculty meets to review ***Annual Program Improvement Report*** and plan consequent actions to improve the program
4	University SET deadline (required)	Instructors	Conduct in-class paper SET or remind students to complete on-line SET
5	Deadline for submitting course grades	Instructors for courses in which Program Outcomes are assessed	Submit to Program Improvement Coordinator an ***Outcome Assessment Record Sheet*** for each Program Outcome measured in course

Spring Semester			
	Deadline	**Responsible Party**	**Activity**
1	Thursday prior to first day of classes	Program Improvement Coordinator	Remind instructors of courses in which Program Outcomes are to be assessed in the spring semester to review
2	University SET deadline (required)	Instructors	Conduct in-class paper SET or remind students to complete on-line SET
3	Graduating Senior Survey deadline	Instructor(s) for MECH 440B	Remind students in MECH 440B to complete online Graduating Senior Survey
4	Deadline for submitting course grades	Instructors in courses in which Program Outcomes are assessed	Submit to Program Improvement Coordinator an ***Outcome Assessment Report Sheet*** for each Program Outcome measured in course

Summer Break			
	Deadline	**Responsible Party**	**Activity**
1	7 days prior to fall classes	Dean	Prepares ***Graduating Senior Survey Summary Repor***t
2	7 days prior to fall classes	Program Improvement Coordinator	Prepares ***Annual Program Improvement Report***
3	7 days prior to fall classes	Department Chair	Prepares ***Summary of Comments on Graduating Senior Survey*** and ***Summary of Alumni Survey***

2. PROGRAM MISSION AND VISION

2.1 Statement of Program Mission

An entity's mission and vision should govern its plan for continuous improvement. The mission statement for the Mechatronic Engineering Program as printed in the University Catalog (http://catalog.csuchico.edu/viewer/15/ENGR/MENGNONEBS.html) and included on the Program's website (http://www.csuchico.edu/mmem/programs/bs_mechanical_engineering/index.shtml) follows.

The Mechanical Engineering Program has the primary mission of providing students a high-quality undergraduate education with

1. *A curriculum that is firmly grounded in engineering fundamentals*
2. *A faculty that provides superior teaching and mentoring both in and out of the classroom*
3. *A faculty whose focus is undergraduate education*
4. *Class sizes that encourage student participation*
5. *Project experiences that build on fundamentals and develop team skills*
6. *Facilities and equipment that are readily accessible*
7. *An environment that is conducive to learning and encourages students from different genders and backgrounds*

The faculty is committed to offer a broad undergraduate experience that will promote professional growth and prepare students for a variety of engineering careers, graduate studies, and continuing education.

2.2 Statement of Program Vision

The CSU, Chico Mechanical Engineering Program is committed to providing a superior undergraduate learning experience that is the first choice among CSU bound engineering students.

3. PROGRAM EDUCATIONAL OBJECTIVES

3.1 Statement of Program Educational Objectives

The Mechanical Engineering Program's Educational Objectives are goals for its graduates to achieve a few years after graduation. Mechanical engineering graduates will:

1. *Practice in engineering-related fields chosen from a broad range of industries*
2. *Recognize the need and have the ability to engage in continuing learning to adapt to evolving professions and to advance professionally*

3. *Become contributing members of the society with an understanding of the inherent and unavoidable impact of practicing engineering*

The above Program Educational Objectives are printed on the Program's website (http://www.csuchico.edu/mmem/programs/bs_mechanical_engineering/educational_objectives.shtml).

3.2 Process to Achieve Program Educational Objectives

Since the Educational Objectives are goals which alumni should accomplish within the first few years of professional practice, achievement of those objectives may require experience attained after leaving CSUC. The curriculum is structured to achieve the Program Outcomes described in Section 4. If these outcomes are appropriate and are achieved by all graduates, and all graduates then enter appropriate professional practice, the Program Educational Objectives could be satisfied.

Thus, while it is expected that all alumni will meet the Program Educational Objectives, this cannot be assured. Table II graphically shows the relation between Outcomes and Objectives and how achievement of the Program Outcomes supports achievement of the Program Educational Objectives. Note that achievement of some Program Outcomes results in realization of a major portion of some Program Educational Objectives. In Table II these are labeled "strong support". Other Program Outcomes are more modest in their support and are so indicated.

3.3 Review of Program Educational Objectives

The PEOs will be reviewed every three years involving program constituencies. Major program constituencies including program faculty, current students, alumni, and employers of program graduates will be consulted regularly for input and data collection. In addition, secondary constituencies including parents of current students, prospective students, parents of prospective students, CSUC faculty in other departments, professional organizations, and other engineering and technology companies will be involved when available.

Annually, major program constituencies may be consulted at appropriate meetings.

- Program faculty: weekly faculty meetings
- Current students: spring semester at club meetings, competition team meetings, and through email
- Alumni: alumni surveys, round table discussion of alumni with faculty during the Alumni in the Classroom event held in the National Engineers Week in February
- Employers of graduates: Industry Advisory Board meeting in May, and career fairs

Secondary program constituencies may be involved in occasions such as

- Preview Day in October

- Choose Chico! Day in March
- College of ECC Design Expo day in May
- Industry Advisory Board meeting in May

Mechanical Engineering Program Outcomes

Mechanical Engineering Program Objectives

Table II

Support of Program Educational Objectives by Program Outcomes

Strong Support

Modest Support

Mechanical engineering graduates will:	a. Ability to apply knowledge of mathematics, science, and engineering	b1. Ability to design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specifications	b2. Ability to conduct experiments, as well as to analyze and interpret data	c1. Ability to design mechanical system, component, or process to meet desired needs within realistic constraints	c2. Ability to design a thermal system, component, or process to meet desired needs within realistic constraints	d. Ability to function effectively as members of multidisciplinary teams	e1. Ability to define engineering problems	e2. Ability to solve engineering problems	f. Understanding of professional ethical responsibility	g1. Ability to communicate technical matters effectively in oral form	g2. Ability to communicate technical matters effectively in written form	g3. Ability to communicate technical matters effectively in graphical form	h. Broad education necessary to understand impact of engineering solutions in a global, economic, environmental, and societal context	i. Recognition of need for, and ability to engage in, life-long learning	j. Knowledge of contemporary issues	k. Ability to use techniques, skills, and modern engineering tools necessary for engineering practice
1. Practice in engineering-related fields chosen from a broad range of industries																
2. Recognize the need and have the ability to engage in continuing learning to adapt to evolving professions and to advance professionally																
3. Become contributing members of the society with an understanding of the inherent and unavoidable impact of practicing engineering on society																

3.4 Assessment of Achievement of Program Educational Objectives

The observations of alumni by the company representatives described in Section 3.3 provide evidence of achievement of Program Objectives. In addition, annually alumni who graduated three and six years earlier will be surveyed to assess their perception of achievement of the Educational Objectives. Appendix C includes a sample survey instrument containing questions that generate useful data for the assessment.

Annually at the beginning of the academic year, the Program Improvement Coordinator will present information gathered in the previous year to the program faculty.

4. PROGRAM OUTCOMES

4.1 Statement of Program Outcomes

Mechanical Engineering Program graduates must have:

- *a . An ability to apply knowledge of mathematics, science, and engineering*
- *b_1. An ability to design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specifications*
- *b_2. An ability to conduct experiments, as well as analyze and interpret data*
- *c_1. An ability to design a mechanical system, component, or process to meet desired needs within realistic constraints*
- *c_2. An ability to design a thermal system, component, or process to meet desired needs within realistic constraints*
- *d. An ability to function effectively as members of multidisciplinary teams*
- *e_1. An ability to define engineering problems*
- *e_2. An ability to solve engineering problems*
- *f. An understanding of professional ethical responsibility*
- *g_1. An ability to communicate technical matters effectively in oral form*
- *g_2. An ability to communicate technical matters effectively in written form*
- *g_3. An ability to communicate technical matters effectively in graphical form*
- *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 mechanical engineering tools necessary for engineering practice*

The Program Outcomes are included on the Department's website (http://www.csuchico.edu/mmem/programs/bs_mechanical_engineering/program_outcomes.shtml).

4.2 Process to Achieve Program Outcomes

The principal means for attaining the Program Outcomes is the formal, required portion of the Program, i.e., the required courses. This is the only element of the Program to which all students are exposed that significantly develops competencies embodied in the Program Outcomes. The required courses which contribute to attainment of the Program Outcomes are listed in Table III.

Mechanical Engineering Program Outcomes

Table III

Courses Which Contribute to Attainment of Program Outcomes

Major contribution
Minor contribution

*Includes laboratory or activity

Courses	a. An ability to apply knowledge of mathematics, science, and engineering	b1. An ability to design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specifications	b2. An ability to conduct experiments, as well as to analyze and interpret data	c1. An ability to design a mechanical system, component, or process to meet desired needs within realistic constraints	c2. An ability to design a thermal system, component, or process to meet desired needs within realistic constraints	d. An ability to function effectively as members of multidisciplinary teams	e1. An ability to define engineering problems	e2. An ability to solve engineering problems	f. An understanding of professional ethical responsibility	g1. An ability to communicate technical matters effectively in oral form	g2. An ability to communicate technical matters effectively in written form	g3. An ability to communicate technical matters effectively in graphical form	h. The broad education necessary to understand impact of engineering solutions in a global, economic, environmental, and societal context	i. A recognition of the need for, and ability to engage in, life-long learning	j. A knowledge of contemporary issues	k. An ability to use techniques, skills, and modern engineering tools necessary for engineering practice
1. MATH 120,121,220,260 – Calc, Diff Eqs																
2. CHEM 111 – General Chemistry *																
3. PHYS 204A,B – Physics *																
4. CIVL 211 – Statics																
5. CIVL 302 – Engr Econ and Statistics																
6. CIVL 311 – Strength of Materials																
7. CIVL 321 – Fluid Mechanics *																
8. CIVL 495 – Professional Issues in Engr.																
9. EECE 211 – Linear Circuits I																
10. EECE 211L – Linear Circuits I Act *																
11. MECH 100 – Graphics I																
12. MECH 100L – Graphics I Laboratory *																
13. MECH 140 – Intro to Engr Design *																
14. MECH 200 – Graphics II *																
15. MECH 208 – Intro Technical Computing																
16. MECH 210 – Materials Science/Engr *																
17. MECH 306 – Eq Solving Techniques *																
18. MECH 308 – Finite Element Analysis *																
19. MECH 320 – Dynamics																
20. MECH 332 - Thermodynamics																
21. MECH 338 – Heat Transfer *																
22. MECH 340 – Mechanical Engr Design*																
23. MECH 432 – Energy Systems *																
24. MECH 440A – Mechanical Design Proj I																
25. MECH 440B – Mechanical Design Proj II																
26. MECA 380 – Measurement/Instrument *																
27. MECA 482 – Control System Design *																
28. MFGT 160 – Manufacturing Processes *																
29. General Education courses																

The curriculum has been structured to produce the Program Outcomes. Most of the courses in the curriculum teach the students math, science, and engineering topics which empower them to apply that knowledge (Program Outcome a).

Selected courses teach students to design experiments (Program Outcome b1) and conduct experiments and analyze and interpret the resultant data (Program Outcome b2). These include the lab portions of the courses indicated on Table II. These experiences in experimentation culminate in MECH 440B (the second course of the capstone design sequence) in which students must design tests, perform the tests, and analyze the data collected to verify that their designs satisfy the problem specifications.

The primary courses which lead to Program Outcome c1, "an ability to design a mechanical system, component, or process to meet desired needs within realistic constraints", are MECH 140, MECH 340, MECH 440A, and MECH 440B. Similarly, the primary courses which lead to Program Outcome c2, "an ability to design a thermal system, component, or process to meet desired needs within realistic constraints", are MECH 338, MECH 432, MECH 440A, and MECH 440B. Note that while some students in MECH 440A and B design a system which has both mechanical and thermal aspects, some design systems which are strictly mechanical or thermal in nature.

Training in team skills to attain Program Outcome d begins in MECH 140 (Introduction to Engineering Design) and is a major part of the capstone design project; however, the teams which are formed in these classes are not multi- disciplinary. A multi-disciplinary team project occurs in MECH 440A/B (Lifelong Development for Engineers) where a team of students from various engineering disciplines (civil, computer, mechanical, and mechatronic engineering) do a feasibility study.

Defining engineering problems (Outcome e1) begins in MECH 140, is reinforced in engineering analysis courses, and is strongly emphasized in the capstone design course MECH 440A. Solving engineering problems (Outcome e2) is demonstrated in many engineering analysis courses and driven home in the MECH 340, and MECH 440A, and MECH 440B.

The foundations of ethics are introduced to some students in some general education courses. All students are exposed to professional ethical responsibilities in CIVL 495 where they gain an understanding of these responsibilities (Program Outcome f).

The communication skills in Program Outcomes g1 and g2 are taught in general education courses as well as courses in the major. The foundation for oral and written communication skills are set down in the required general education oral communication (CMST 131 or CMST 132) and writing (ENGL 130) courses. Each of the remaining general education courses are required to have a writing component to refine the students' skills. In some engineering courses, writing is also required, culminating with major design reports in the capstone design project in MECH 440A and MECH 440B. Graphical communication skills (Program Outcome g3) are taught in MECH 100, MECH 100L, and MECH 200 and bolstered in MECH 340 and the capstone design project.

Program Outcomes h and j are in large part dealt with in the general education portion of the curriculum. In the major requirements, CIVL 495 (Professional Issues in Engineering) treats some of these issues.

The importance of continued learning (Program Outcome i) is apparent to students in MECH 340 where design projects require them to find information not discussed in class or in the textbook. The capstone design project (MECH 440 A and B) almost always requires more information than students obtained in their preceding classes. This topic is discussed more formally in CIVL 495.

In support of Program Outcome k, the following mechanical engineering tools are taught.

- Computer-Aid Drafting

SolidWorks®	MECH 100L, MECH 200

- Equation Solvers

TK Solver®	MECH 340
Excel®	MECH 306
MatLab®	MECH 208, MECH 306, MECA 482
Simulink®	MECA 482
IHT®	MECH 338, MECH 432

- Finite Element Analysis

Cosmos®	MECH 308

- Instrument Control

Basic	MECA 380
LabVIEW®	MECA 380

Some students participate in extracurricular student organizations and competitions, and these activities contribute to attainment of some Program Outcomes. The following student organizations sponsor guest speakers, field trips, service projects, and/or attendance at regional parent organization meetings, workshops, and/or conferences.

- American Institute of Mechatronic Engineers Club
- American Society of Mechanical Engineers (ASME) Student Chapter
- Society of Manufacturing Engineers (SME) Student Chapter
- Society of Plastics Engineers (SPE) Student Chapter
- Tau Beta Pi Engineering Honor Society Student Chapter

For the students who participate, these activities contribute to the attainment of Program Outcomes e_2, f, g_1, g_2, g_3, h, i, and j.

Participation in the following competitions contributes to attainment of Program Outcomes a, c_1, d, e_2, g_1, g_2, g_3, and i.

- ASME Human Powered Vehicle Challenge
- Formula SAE Competition
- Intelligent Ground Vehicle Competition
- SAE Baja® Competition

Finally, the university experience itself contributes to attainment of Program Outcomes d, f, g_1, h, i, and j in a variety of ad hoc ways such as attendance at campus public events (e.g., plays, concerts, speakers), contact with faculty outside of class, and through living situations (e.g., dorms, and communal renting of apartments and houses).

4.3 Assessment of Achievement of Program Outcomes

It is unrealistic to rely on a single mechanism to assess achievement of the Program Outcomes. Consequently, each outcome is measured by several complementary metrics. Grades, performance on the national Fundamentals of Engineering exam, specific assignments in selected courses, and surveys of graduating seniors are all used. Table IV summarizes the specific course in which each outcome is assessed.

For each Program Outcome that is assessed in each selected course, a ***Mechanical Engineering Program Outcome Record Sheet*** is completed each term by the course instructor and submitted to the Program Improvement Coordinator who then places them in the ***Mechanical Engineering Program Improvement Plan File*** and archives them in the MMEM Resource Community folder on campus Bay server, a repository of Department documents available to Department faculty and staff on-line. Appendix A is a sample of this Excel spreadsheet.

The online Graduating Senior Survey is conducted once each academic year targeting graduating seniors enrolled in MECH 440B. The survey is conducted near the end of the spring semester. Students graduating at the end of a fall semester normally will have taken MECH 440B the previous spring and will be included in that survey. The paper copies of all the survey instruments are archived in the ***Mechanical Engineering Program Improvement Plan File***. Appendix B contains a copy of the survey instrument.

Mechanical Engineering Program Outcomes																
Table IV ***Mechanisms for Assessing Program Outcomes***	**a. An ability to apply knowledge of mathematics, science, and engineering**	**b_1. An ability to design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specifications**	**b_2. An ability to conduct experiments, as well as to analyze and interpret data**	**c_1. An ability to design a mechanical system, component, or process to meet desired needs within realistic constraints**	**c_2. An ability to design a thermal system, component, or process to meet desired needs within realistic constraints**	**d. An ability to function effectively as members of multidisciplinary teams**	**e_1. An ability to define engineering problems**	**e_2. An ability to solve engineering problems**	**f. An understanding of professional ethical responsibility**	**g_1. An ability to communicate technical matters effectively in oral form**	**g_2. An ability to communicate technical matters effectively in written form**	**g_3. An ability to communicate technical matters effectively in graphical form**	**h. The broad education necessary to understand impact of engineering solutions in a global, economic, environmental, and societal context**	**i. A recognition of need for, and ability to engage in, life- long learning**	**j. A knowledge of contemporary issues**	**k. An ability to use techniques, skills, and modern engineering tools necessary for engineering practice**
Courses																
1. MECH 306 – Eq Solving Techniques																■
2. MECH 308 – Finite Element Analysis																■
3. MECH 338 – Heat Transfer					■											
4. MECH 340 – Mechanical Engr Design	■			■							■	■				
5. MECH 440A – Mech Engr Design Proj I						■	■		■	■				■		
6. MECH 440B – Mech Engr Design Proj II		■											■		■	
7. MECA 380 – Measurement/Instrument			■													■
8. MECA 482 – Control System Design								■								

Outcome a

Many courses in the curriculum strengthen a student's ability to apply knowledge of mathematics, science, and engineering; thus, a student's major GPA (which includes all required math, science, and engineering courses) is a measure of a student's achievement of Outcome a. A major GPA of 2.0 (C) is required for graduation in Mechanical Engineering with at least a D in each course.

Passing the national standardized Fundamentals of Engineering Exam is an external measure of a student's achievement of Outcome a. All students are encouraged to take the exam to graduate.

For Mechanical Engineering majors, a minimum of three (3) exams in MECH 340 are used to measure the general competency in applying mathematics, science, and engineering knowledge to solve problems. An average grade of C- or better demonstrates basic competency.

The graduating senior survey reveals students' perceptions of their abilities to apply math, science, and engineering. On a scale of 5 ("very well prepared") to 1 ("very unprepared"), a mean response of 4 to the question "Based on your experience at Chico State, how well prepared are you to apply knowledge of math, science, engineering, or technology to solve problems" is considered acceptable.

Outcome b_1

In MECH 440B each student is required to write a test plan to evaluate the performance of the student's senior project. A grade of C or better for the assessment assignments is needed to demonstrate basic competency.

Two questions on the graduating senior survey reveal students' perceptions of their abilities to design experiments. The questions are "based on your experience at Chico State, how well prepared are you to design and conduct experiments" and "based on your educational experience here at Chico State, how well prepared are you to plan a test and verification program". On a scale of 5 ("very well prepared") to 1 ("very unprepared," a mean response of 4 or better to each of the questions is considered acceptable.

Outcome b_2

In MECA 380 each student is required to complete at least a laboratory assignment designed to assess the student's ability to conduct an experiment, analyze the data, and interpret the results. A grade of C or better for the assignment is needed to demonstrate basic competency.

Outcome c_1

The required course which assesses a student's ability to design a mechanical system, component, or process to meet desired needs within realistic constraints is MECH 340. The student must receive a C or better on the design project which requires a student to demonstrate basic competency in mechanical design.

Two questions on the graduating senior survey reveal students' perceptions of their abilities to design components or systems. The questions are "based on your experience at Chico State, how well prepared are you to design a component or system to meet desired needs" and "based on your educational experience here at Chico State, how well prepared are you to integrate a number of parts into a subsystem". On a scale of 5 ("very well prepared") to 1 ("very unprepared"), a mean response of 4 or better to the each question is considered acceptable.

Outcome c_2

Basic competency to design a thermal system, component, or process to meet desired needs within realistic constraints is assessed in MECH 338. The questions asked on the senior exit survey relating to Outcome c_1 are also related to Outcome c_2. A grade of C or better for the assignment is needed to demonstrate basic competency.

Outcome d

Multi-disciplinary team projects are conducted each semester in the required course Mechanical Engineering Design I (MECH 440A). Teams of engineering majors from three or four different programs are formed. The projects involve a feasibility study

which has civil, electrical, and mechanical aspects. Each team member is expected to function as an expert in the member's major area. The projects are presented orally together with a written report. Evaluation of a project includes an assessment of each team member's ability to work effectively as a member of a team.

While not always multi-disciplinary, senior project teams in MECH 440A are evaluated each year with regard to teamwork. The Faculty Advisor evaluate each student on a pass/fail basis.

The graduating senior survey asks the question "based on your experience at Chico State, how well prepared are you to function on a multidisciplinary team". The question measures the student's perception of the student's ability to function effectively on a multidisciplinary team. On a scale of 5 ("very well prepared") to 1 ("very unprepared"), a mean response of 4 or better is considered acceptable.

Outcome e_1

Each student does a senior project in MECH 440A and 440B. These projects require teams of students to design, fabricate, and test engineering systems. In the process, each student must demonstrate basic competency in defining an engineering problem. A grade of C or better for the assessment assignment is needed to demonstrate basic competency.

Outcome e_2

Basic competency in solving an engineering problem is assessed in MECA 482 (Control System Design), a required course. A grade of C or better for the assessment assignment is needed to demonstrate basic competency.

Outcome f

A basic understanding of an engineer's professional ethical responsibility is assessed in MECH 440A (Mechanical Engineering Design I), a required course. An average grade of C or better for the assessment assignments is needed to demonstrate basic competency.

The graduating senior survey reveals students' perceptions of their understanding of their professional ethical responsibilities. On a scale of 5 ("very well prepared") to 1 ("very unprepared"), a mean response of 4 or better to the question "based on your experience at Chico State, how well prepared are you to understand professional and ethical responsibilities" is considered acceptable.

Outcome g_1

Basic competency in oral communication is evaluated in MECH 440A. The assessment is done by faculty at design reviews on a pass/fail basis.

The graduating senior survey reveals students' perceptions about their ability to effectively communicate technical matters orally. On a scale of 5 ("very well prepared") to 1 ("very unprepared"), a mean response of 4 or better to the question "based on your experience at Chico State, how well prepared are you to communicate technical matters in writing" is considered acceptable.

Outcome g_2

Basic competency in written communication is evaluated in MECH 340. An average grade of C or better for the assessment assignments is needed to demonstrate basic competency.

The graduating senior survey reveals students' perceptions about their ability to effectively communicate technical matters in writing. On a scale of 5 ("very well prepared") to 1 ("very unprepared"), a mean response of 4 or better to the question "based on your experience at Chico State, how well prepared are you to communicate technical matters in writing" is considered acceptable.

Outcome g_3

Selected coursework from MECH 340 is evaluated by the instructor to assess students' abilities to effectively communicate graphically. An average grade of C or better for the assessment assignments is needed to demonstrate basic competency.

Outcome h

The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context is assessed in MECH 440B (Mechanical Engineering Design II). An average grade of C or better for the assessment assignments is needed to demonstrate basic competency.

Outcome i

Recognition of the need for, and an ability to engage in, life-long learning is assessed in the required course MECH 440A (Mechanical Engineering Design I). An average grade of C or better for the assessment assignments is needed to demonstrate basic competency.

The graduating senior survey reveals students' perceptions about their ability to continue learning. On a scale of 5 ("very well prepared") 1 ("very unprepared"), a mean response of 4 or better to the question "based on your experience at Chico State, how well prepared are you to continue learning" is considered acceptable on both surveys.

Outcome j

A basic knowledge of contemporary issues is assessed in the required course MECH 440B (Mechanical Engineering Design II). An average grade of C or better for the assessment assignments is needed to demonstrate basic competency.

Outcome k

Basic competency using modern mechanical engineering tools is assessed in MECH 306, MECH 308, and MECA 380 by demonstrating basic competency using MatLab®, Cosmos®, and LabVIEW®, respectively, on selected assignments. An average grade of C or better for the assessment assignments is needed to demonstrate basic competency.

The graduating senior survey reveals students' perceptions of their abilities to use current mechanical engineering tools. On a scale of 5 ("very well prepared") to 1 ("very unprepared"), a mean response of 4 or better to the question "based on your experience at Chico State, how well prepared are you to use modern tools and technology" is considered acceptable.

The measurement instruments and criteria described above maybe modified slightly by the course instructors for assessing basic competency in the defined Program Outcomes.

4.4 Summary of Senior Survey

Annually, the Dean prepares a Graduating Senior Survey Summary Report which includes results from all programs in the College.

5. PROGRAM IMPROVEMENT

5.1 Annual Program Improvement Report

Each year, the Program Improvement Coordinator will submit an Annual Mechanical Engineering Program Improvement Report to the Dean. This report summarizes data collected since the last annual report, makes recommendations based upon this data for areas in which to make improvements, and describes actions taken to improve the program since the last report. The report could include data from:

1. Outcome Assessment Record Sheets from the previous academic year
2. Graduating senior survey
3. Student Evaluation of Teaching (SET)
4. Alumni survey
5. Industrial site visits

5.2 Process to Use Results of Assessment to Improve the Program

Each fall, the faculty meets to discuss the Annual Program Improvement Report, decide if changes in the program are warranted, and, if so, formulate a plan to effect those changes.

Appendix A

Mechanical Engineering Program Outcome Record Sheet

Mechanical Engineering Program Outcome Record-Sheet

Course:		**Semester:**	
ME Program Outcome:		**Instructor:**	

Description of instruments used in this course to measure attainment of program outcome:	1	
	2	
	3	
	4	
	5	
	6	

How instruments are used to measure achievement of program outcome:	1	
	2	
	3	
	4	
	5	
	6	

Number of ME students in class achieving program outcome:	0	#DIV/0!
Number of ME students in class not achieving program outcome:	0	#DIV/0!

Comments on the suitability of the instruments used to measure achievement of the program outcome:

Suggestions for possible changes of how achievement of the program outcome can be measured:

Suggestions for improving the program:

Note: Shaded fields are to be fill-in.

1 of 2

MECH Program Outcome:								
MECH Student Name	**Instrument Number**						**Outcome achieved?**	**Course**
	1	**2**	**3**	**4**	**5**	**6**	(Y or N)	**Grade**

Number of Mechatronic Engineering students in course: 0

Appendix B

Graduating Senior Survey Questionnaire

Reset Survey

ECC Graduating Senior Survey
College of Engineering, Computer Science, and Construction Management
CSU, Chico

Dear Graduating Senior,

The College of ECC has developed this Survey to give you a forum for letting us know what you think of your experience at CSU, Chico, and to help us to continually improve the curriculum and services we offer. We care a great deal about the programs and your feedback is essential to helping us provide the highest quality education we can deliver. Thank you in advance for your time and attention to this survey.

We hope the years you have spent with us have enriched your life and provided you with the foundation for a successful career. Please stay in touch!

With best wishes, The College of ECC Faculty

Educational Satisfaction Questions

At Chico State, how satisfied were you with the...	Very Dissatisified				Very Satisfied
1. Quality of teaching by faculty in your department	○	○	○	○	○
2. Quality of teaching by other faculty	○	○	○	○	○
3. Access to faculty in your department	○	○	○	○	○
4. Availability of courses in your department	○	○	○	○	○
5. Quality of courses in your department	○	○	○	○	○
6. Access to laboratory facilities and equipment	○	○	○	○	○
7. Quality of laboratories and equipment	○	○	○	○	○
8. Access to computer facilities	○	○	○	○	○
9. Quality of computer facilities	○	○	○	○	○
10. Academic Advising from your major advisor	○	○	○	○	○
11. Academic Advising from the University Advising Office	○	○	○	○	○
12. Career information from your department	○	○	○	○	○
13. Availability of General Education courses	○	○	○	○	○
14. Quality of General Education courses	○	○	○	○	○
15. The overall quality of your education	○	○	○	○	○
16. Your overall experience at Chico State	○	○	○	○	○

Program Outcomes Questions

Based on your educational experience here at Chico State, how well prepared are you to...	Very Unprepared				Very Prepared
17. Apply knowledge of math, science, engineering, or technology to solve problems	○	○	○	○	○
18. Design and execute test procedures (for equipment/hardware components or software)	○	○	○	○	○
19. Analyze, assess, and interpret data/results from test procedures	○	○	○	○	○
20. Design a component or system to meet desired needs	○	○	○	○	○
21. Function in a multidisciplinary team	○	○	○	○	○
22. Identify, formulate and solve technical problems	○	○	○	○	○
23. Communicate technical matters in writing	○	○	○	○	○
24. Communicate technical matters orally	○	○	○	○	○
25. Understand and apply professional and ethical principles	○	○	○	○	○
26. Understand contemporary issues facing society	○	○	○	○	○
27. Use modern tools and technology	○	○	○	○	○
28. Appreciate impact of your solutions on society and environment	○	○	○	○	○
29. Continue learning	○	○	○	○	○
	Strongly Disagree				Strongly Agree
30. I would recommend my major program at CSU, Chico to others.	○	○	○	○	○

31. Major: Please Select One...

32. Graduation Date

Semester ◯ Spring ◯ Summer ◯ Fall

Year ◯ 2012 ◯ 2013 ◯ 2014 ◯ 2015

33. Did you come to Chico State as a ... ◯ First-time freshman ◯ Transfer

34. How many semesters did you attend Chico State? ◯ 1-3 ◯ 4-6 ◯ 7-9 ◯ 10-12 ◯ 13+

35. What is your Overall GPA?

◯ Below 2.25

◯ 2.25-2.49

◯ 2.50-2.74

◯ 2.75-2.99

◯ 3.00-3.24

◯ 3.25-3.49

◯ 3.50-3.74

◯ 3.75-4.00

36. If you had an internship, co-op, or job related to your major while in school, how valuable was the experience?

◯ Did not have internship, co-op, or job

◯ Very Valuable

◯ Valuable

◯ Somewhat Valuable

◯ Not Valuable

37. If you were involved in any student/professional society, activities, or clubs, how valuable was the experience?

◯ Was not involved in societies, activities, or clubs

◯ Very Valuable

◯ Valuable

◯ Somewhat Valuable

◯ Not Valuable

38. Immediately after graduating are you planning to...

Attend graduate School ◯ Yes ◯ No

Begin Working ◯ Yes ◯ No

If you are NOT planning to work full-time, or if you have not begun looking for a job, please skip to Question 13.

39. How many job offers have you received? ◯ None ◯ One ◯ Two ◯ Three ◯ Four +

40. Do you currently have a job offer that you are likely to accept?

◯ Yes

◯ No

41. If you interviewed through the campus Career Planning & Placement Office, how helpful was it?

◯ Did not interview through campus office

◯ Very Helpful

◯ Helpful

◯ Somewhat Helpful

◯ Not Helpful

42. If you found a job that you are likely to accept, how did you find it?

◯ Campus Career Planning & Placement Office

◯ Faculty/department referral

◯ Online Posting

◯ Mailed resume

◯ Personal Connections

◯ Other

43. Did you take a comprehensive exam (FE, CMdgT, MFT or other) for your discipline?

◯ No, did not take

◯ Yes, and passed

◯ Yes and did not pass

◯ Yes and waiting for results

44. If you took a comprehensive exam, did you also attend a review course to prepare you for the exam?

◯ Yes

◯ No

MENG Supplemental Questions

Based on your educational experience at Chico State, how well prepared are you to:	Very Unprepared				Very Prepared
1. Communicate manufacturing needs, including tolerances, to a technician	○	○	○	○	○
2. Write verifiable engineering specifications based on customer needs	○	○	○	○	○
3. Create a Gantt chart for a project	○	○	○	○	○
4. Identify the critical path for a project	○	○	○	○	○
5. Develop a detailed project budget	○	○	○	○	○
6. Present information for a design review	○	○	○	○	○
7. Prepare and execute an experimental test plan	○	○	○	○	○
8. Select hardware and develop software for automated data collection	○	○	○	○	○
9. Analyze pressure drop and select a pump for a piping system	○	○	○	○	○
10. Select a material for a specific application	○	○	○	○	○
11. Use simulation software for stress or heat transfer analysis	○	○	○	○	○
12. Verify finite element analysis results through traditional analysis techniques	○	○	○	○	○
13. Solve equations using numerical techniques	○	○	○	○	○
14. Simulate or write equations of the performance of a system	○	○	○	○	○
15. Select machine parts and lubrication for a particular application	○	○	○	○	○
16. Analyze a thermal problem and select a suitable heat exchanger or heat sink	○	○	○	○	○
17. Solve a heat transfer problem using thermal resistances	○	○	○	○	○
18. Select a motor for a particular application	○	○	○	○	○

19. In the space provided, please provide additional comments that will help faculty to improve the quality of the education they provide.

You Have 3500 Characters Remaining.

Submit

Appendix C

Alumni Survey Questionnaire

Alumni Survey **Date: _____**

Name: _____

Degree Major: _____

Year graduated: _____

Company name currently working: _____

Current job title: _____

Length of time working as an engineer (years): _____

Do you have a graduate degree? _____

Have you acquired additional work-related education or training? What kind? _____

_____

Based on your educational experience her at Chico State how well prepared are you to…(Score 1 for not well prepared to 5 for well prepared)

Apply knowledge of mathematics, science, and engineering. *Score: ___*
Design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specification. *Score: ___*
Conduct experiments, as well as analyze and interpret data. *Score: ___*
Design a mechanical system/ component/process to meet desired needs within realistic constraints. *Score: ___*
Design a thermal system, component, process to meet desired needs within realistic constraints. *Score: ___*
Function effectively as members of multidisciplinary teams. *Score: ___*
Define engineering problems. *Score: ___*
Solve engineering problems. *Score: ___*
Understand professional ethical responsibility. *Score: ___*
Communicate technical matters effectively in oral form. *Score: ___*
Communicate technical matters effectively in written form. *Score: ___*
Communicate technical matters effectively in graphical form. *Score: ___*
Understand the impact of engineering solutions. *Score: ___*
Recognize the need for, ability to engage in, life-long learning. *Score: ___*
Understand contemporary issues. *Score: ___*
Use the techniques, skills, and modern mechanical engineering tools necessary for engineering practice. *Score: ___*
Enter the engineering workplace or company. *Score: ___*

Other needed student learning outcomes.

_____
_____
_____

Comments

_____
_____
_____