Mechanical Engineering Program

Annual Program Improvement Report

2014 - 2015

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Table of Contents

Contents

1. Introduction 3
2. Actions Taken in 2014-2015 to Improve The Program 3
   2.1 Areas Recommended for Improvement in 2013-2014 Program Improvement Report. 3
   2.1.1 Faculty Instructional Effectiveness 3
   2.1.2 Fundamentals of Engineering (FE) exam participation 7
   2.13 Lab equipment upgrade 8
   2.1.4 Graduating Senior Survey and SET Participation Rates 8
   2.1.5 CIVL 495 Data for Program Assessment 8
3. Program Educational Objectives and Student Learning Outcomes Assessments 8
   3.1 Statement of Program Educational Objectives 8
   3.2 Student Learning Outcomes 9
   3.3 Assessment of Achievement of Program Outcomes 9
   3.4 Assessment Data Summaries 13
   3.5 Summary of Senior Survey 14
   3.6 Alumni Survey 16
   3.8 Student Evaluation of Teaching (SET) 19
4. Program Improvement Recommendations 20
   4.1 Annual Program Improvement Report 20
   4.2 Faculty 21
   4.3 Curriculum 21
   4.4 Student Learning Outcomes for CIVL 495 21

Appendices 22
   Mechanical Engineering Program Outcome Record Sheet 22
   Graduating Senior Survey Instrument 24
   Alumni Survey Instrument 30
   Student Instructional Report (SIR II) 32
   MMEM SET (SIRII) Results Summary for Spring 2015 35

1. Introduction

The Mechanical Engineering Program Improvement Plan from 2013-2014 documents the educational objectives, outcomes, and process to make improvements to the mechanical engineering program, aka "The Program."

This document, the Mechanical Engineering Annual Program Improvement Report provides a summary of findings and actions for the 2014-2015 academic year resulting from implementation of the Mechanical Engineering Program Improvement Plan.

This report is divided into three major sections: actions taken in 2014-2015 to improve The Program, assessment data gathered in 2014-2015, and recommendations for improvements to The Program based on assessment results.
More complete data can be found in the assessment files in the file cabinet located in the MMEM Department in OCNL 436A and in the MMEM Department folder in the Chico State Bay server.

2. Actions Taken in 2014-2015 to Improve the Program

2.1 Areas Recommended for Improvement in 2013-2014 Program Improvement Report.

The 2013-2014 Annual Program Improvement Report recommended four areas of improvement, e.g., faculty instructional effectiveness, fundamentals of engineering (FE) exam, curriculum, graduating senior survey, student evaluation of teaching, and student learning outcomes assessment in Civil 495 course.

2.1.1 Faculty Instructional Effectiveness

The 2013-2014 Program Improvement Report identified that instructional effectiveness varied greatly among department faculty. The MMEM department has hired four new faculty members in the last two years, two for the mechanical engineering program, one for the mechatronic engineering program, and one for the sustainable manufacturing program. Some of the new faculty were experiencing some teaching issues that were reported in the student evaluation of teachers (SET) forms. The new faculty were provided with a mentor for the RTP process that included professional development techniques, as well as, advice on teaching techniques.

Some of the faculty excel in teaching and who provide laudable instruction. A few of the instructors, though, fall below the students' expectations. All of the faculty were reminded of

effective teaching techniques and opportunities to use online resources for more effective teaching.
The results from the graduating senior survey identified the quality of teaching by faculty in the MMEM department was rated as 4.1 out of 5 points in a Likert scale questionnaire. The comments from the graduating senior survey included the following positive comments, “My education was amazing at Chico State.” “I have had amazing instructors, incredible collaboration options, descent labs, and an extremely supportive department”. Dr X and Dr. Y were the best. Please continue to hire professors like them”. “The faculty at Chico State did an amazing job preparing me for my future in the workplace.” “All of the professors are very nice, and approachable for any manner.”

The survey also included some negative comments. “I felt the MECHA 380 class should be reorganized. I did not personally learn much in the class.” “Dr. Z was the worst professor.” “The numerical methods class (MECH 208) could be taught better along with measurement. (MECA 380)” “For the most part the faculty was really good at teaching the subject, however there are a few teachers that i feel need improvement”. “Matlab, (MECH 208) Measurement (Labview), . (MECA 380) and Control System (MECA 482) were not the best may be due to subject, however I believe the quality of teaching is not the best and professor can provide clearer explanation.”
Teaching effectiveness can also be measured with the Student Evaluation of Teaching (SET) forms that the students complete in the fall and spring semesters. The SET provides an opportunity for students to rate the quality of education using the Likert scale. An example SET with the SIR II form is provided in the appendix. It lists ten sections and 45 questions that include the following sections:

1. Course organization and planning
2. Communication
3. Faculty/student interaction
4. Assignments, exams, and grading
5. Instructional methods and materials
6. Course outcomes
7. Student effort and involvement
8. Course difficulty, work load, and pace
9. Overall evaluation
10. Student information

The average ratings of the MMEM faculty for eight of the ten categories for MMEM courses for fall of 2014 and spring of 2015 are listed in Figures 1 and 2. The rating scale is 1 to 5 with 5 being most effective.

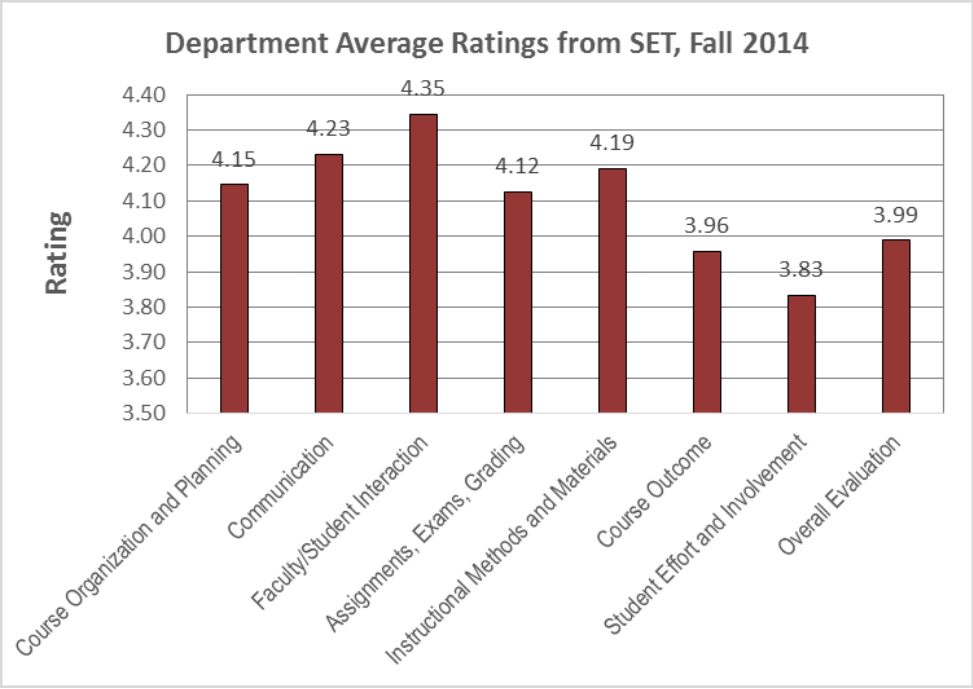

Figure 1. Average SET scores for the MMEM Department in fall 2014

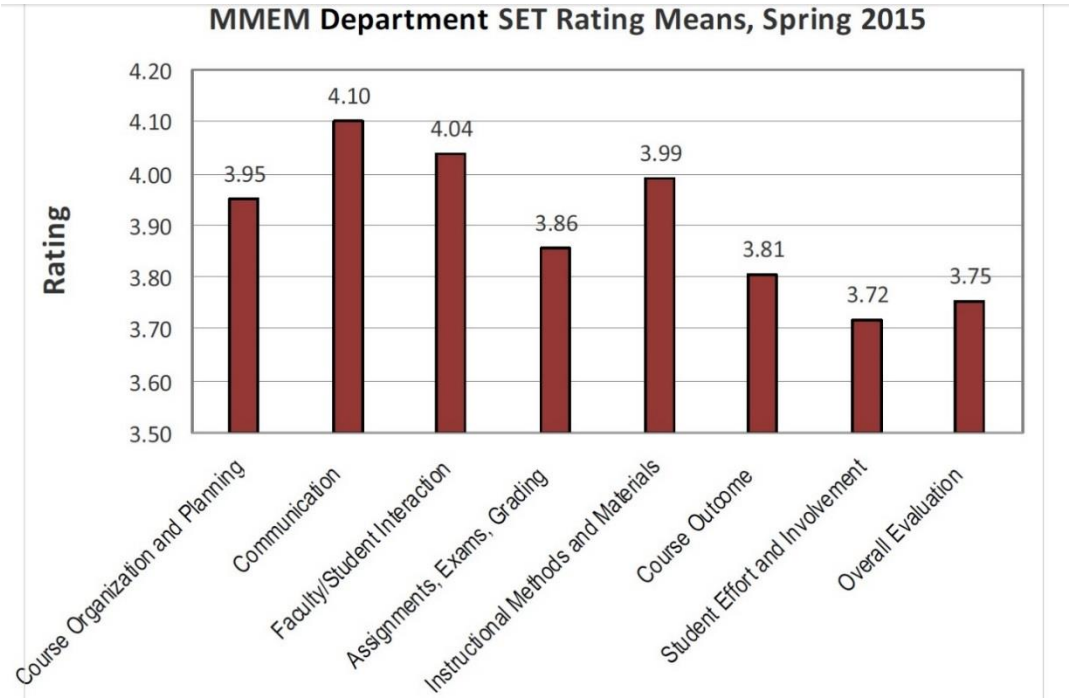

Figure 2. Average SET scores for the MMEM Department in spring 2015

Overall the faculty in the department is deemed very effective in all eight categories. The strengths in the teaching techniques are with “communication”, “faculty/student interactions”, and “instructional methods and materials.” The weaknesses in in the teaching techniques are with “student effort”, “overall evaluation”, and “course outcomes.”

The SET evaluations for “overall evaluation” and “course outcomes” can be expanded across all of the instructors for the courses taught in the spring of 2015. The courses in MMEM are taught by tenured (5 faculty), tenure-track (5 faculty), full-time lecturers (2 faculty), and part-time lecturers (7 faculty). The SET evaluations for the courses taught in the MMEM for the “course outcomes” and “overall evaluation” are listed in the following:

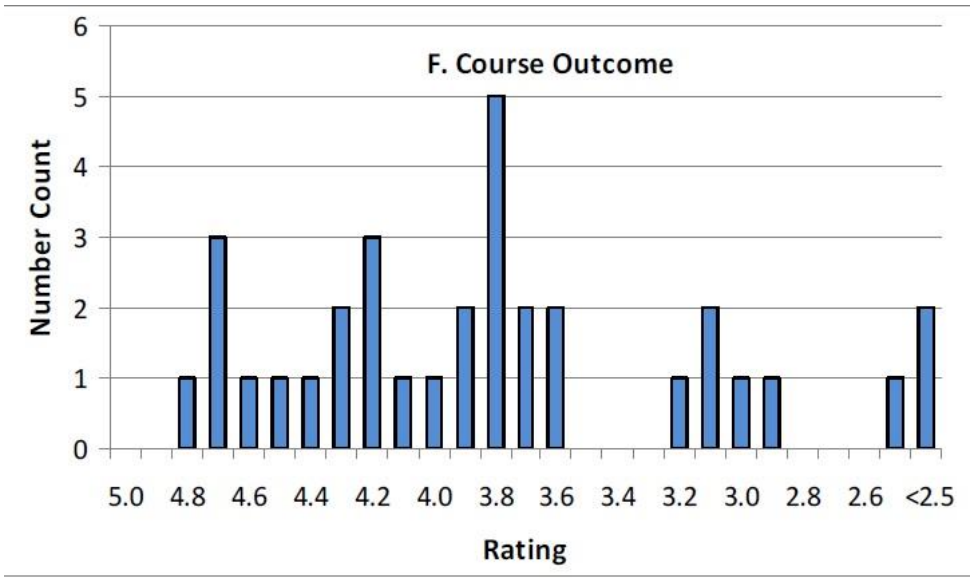

Figure 3. SET scores for the “course outcomes” in MMEM courses in spring 2015

The SET scores illustrates three groupings of scores for the classes. The first group has a score higher than 3.6 and is considered “highly effective.” 50% of the courses had an evaluation of greater than 4.0 and indicated excellent teaching effectiveness. The second group of SET evaluations in the middle of the figure is considered “effective.” The third group on the right with SET scored less than 2.6 is considered “not effective.”

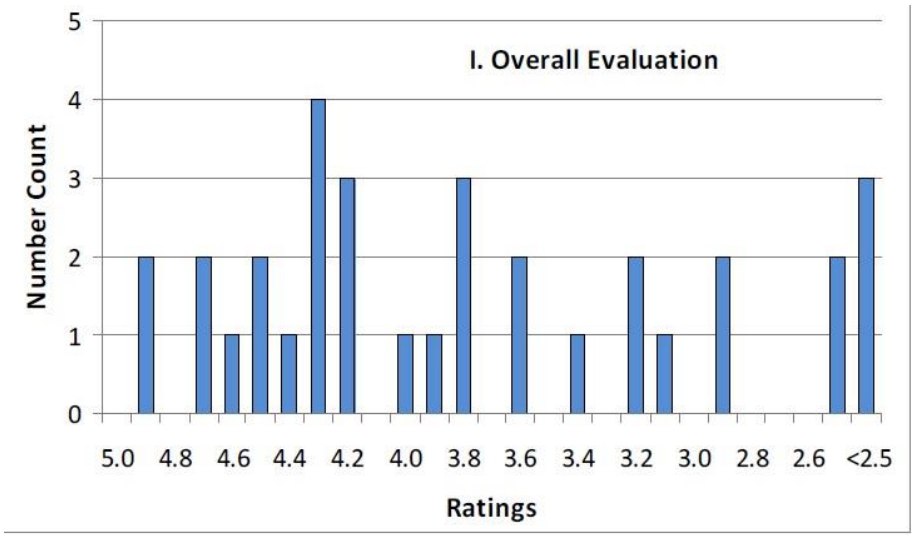

Figure4. SET scores for the "overall evaluation" in MMEM courses in spring 2015

The SET scores illustrates three groupings of scores for the classes. The first group has a score higher than 3.8 and is considered highly effective. The second group of SET evaluations in the middle of the figure is considered effective. The third group on the right with SET scored less than 2.6 is considered not effective.

SET results for the spring 2015 and fall 2014 were distributed to the faculty. Discussions on teaching effectiveness techniques will be discussed in the fall department meetings. Another indicator of faculty instructional quality, although not course specific can be gauged using the responses from graduating senior as to the quality of teaching by faculty in your department. For the last 5 years the rating of the question is listed in the following table.

Table 1. Averages of responses to the question on MMEM faculty teaching quality

Question on survey	2010	2011	2012	2013	2014
Quality of teaching by faculty in your department	3.70	4.00	3.95	3.83	4.16

The results indicate that the changes made to the curriculum and labs have increased the student's evaluation of teaching quality in the department.

2.1.2 Fundamentals of Engineering (FE) exam participation

The MMEM faculty removed the requirement of taking the FE exam in 2012. The students are encouraged to take the FE exam. Table 2 list the results of the FE exam for the last several years.

Table 2. FE exam results for mechanical engineering students

FE Exam Admin/Year	2011-2012	2012-2013	2013-2014	2014-2015
Number of students who took the FE exam	48	31	27	14
Percentage of students who passed the FE exam	50.00	61.11	54.62	78.57

2.13 Lab equipment upgrade

We have upgraded the lab equipment in the Mechatronics Laboratory (MECA 482) and the CNC laboratory for Introduction to Manufacturing course (SMFG 160). Additional laboratory upgrades are being pursued by several faculty with external and internal grants.

2.1.4 Graduating Senior Survey and SET Participation Rates

Student participation is required in the graduating senior survey in the MECH 440 B class in the spring semester. The participation rate is nearly 100%.
The participation rate of students in the SET evaluations depends n the choice of the faculty weather to administer it electronically or with paper. The participation rate of the paper evaluations are higher than with the electronic form.

2.1.5 CIVL 495 Data for Program Assessment

The participation rate for the CIVL 495 in the program assessment was improved for 2014 to 2015 academic year. Assessment data was gathered for fall 2014 and spring 2015 semesters. This will be further explained in the next section.

3. Program Educational Objectives and Student Learning Outcomes Assessments

3.1 Statement of Program Educational Objectives

The Mechanical Engineering Program's educational objectives are best framed in terms of goals for its graduates. Mechanical engineering graduates will:

1. Be effective engineers and problem solvers.
2. Be well educated in the mechanical engineering sciences.
3. Be able to use engineering tools that will enhance their productivity.
4. Be familiar with current technology and how it can be incorporated into their design, analysis, and testing activities including an understanding of manufacturing methods and the use of computers, sensors, and actuators to automate machines and processes.
5. Be effective oral, written, and graphical communicators.

6. Be able to function effectively as members of multidisciplinary teams.
7. Have an appreciation for the individual, society, and human heritage, and be aware of the impact of their designs on human-kind and the environment.
8. Be prepared for a variety of engineering careers, graduate studies, and continuing education.

3.2 Student Learning Outcomes

The educational objectives of the program are achieved mainly through the mechanical engineering curriculum. The educational objectives allow the department to develop student learning outcomes for the students that are associated with courses in the curriculum. Graduates of the Mechanical Engineering Program should demonstrate the following:

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
c_2. An ability to design a thermal system, component, or process to meet desired needs
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 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

3.3 Assessment of Achievement of Program Outcomes

Program outcomes b_1, b_2, g_1, g_2, and k are achieved in multiple courses. Many courses in the curriculum have a lab component, including CHEM 111, CIVL 321, EECE 211L, MECA 380, MECH 100L, MECH 140, MECH 200, MECH 210, MECH 338, MECH 432, MECH 440B, PHYS 204A, PHYS 204B, and SMFG 160. In most cases students do not design experiments (program outcome b_1). The students typically run experiments that are designed by the course instructor or others (program outcome b_2). Nonetheless, these experiences set the groundwork for working with design of experiments in MECH 432 and MECH 440B.

Communication skills are taught in general education courses as well as courses in the major. The foundation of oral communication skills (program outcome g_1) is set down in the required general education speech course (CMST 131 or CMST 132). Academic writing (ENGL 131) is a required general education course that sets the groundwork for proficiency in written communication (program outcome g_2). Each of the remaining general education courses that a student takes has a writing component to the class that improves the writing skills of the student. The Mechanical Engineering program has a writing proficiency course included in the curriculum, i.e., MECH 440A and MECH 440 B. Significant writing assignments are also required in other engineering courses, e.g., CIVL 495, MECA 380, and MECH 340.
Selection of courses and instruments for assessment are based on the course material and structure that are suitable for measurements of the defined outcome. The outcome assessment is conducted every time the selected course is taught.

Students are not aware of the embedded components designed for outcome measurement. Sample size typically is the enrollment of the designated course which changes every semester. Instructors of the same course use similar measurement instruments and measurement criteria. Individual instructors frequently modify exam questions or project assignments.

During the academic year, the chair can distribute an electronic program outcome record sheet for each outcome assessed in the course. The sheet identifies the outcome being assessed, the assessment instrument used, how the instrument is used to demonstrate basic competency, the name of each student in the course, the student's grade or score on each assessment measure, and the student's course grade.

These outcome record sheets are submitted electronically by instructors to the department chair who archives them in the on-line BlackBoard Learn Resource Community and places a hard copy in the Mechanical Engineering program file. The data in these sheets is used together with other information to write the annual program improvement report.

The instructor provides the embedded assessment for the learning outcome to the students in the class. The embedded assessment can be a homework assignment, quiz, exam, or other assignment in the class. A list of the embedded assessments for the classes is provided in Table 3.3. The instructor grades the course work materials that can include the embedded assessment. The list of students passing the embedded assessment in the fall of 2014 and spring of 2015 is provided in the following table.

Table 1. Percentage of mechanical engineering students achieving learning outcomes in 2014-2015

Student Learning Outcome	Sample and Sample Size	Measure	Percent of Students Achieving
a .An ability to apply knowledge of mathematics, science, and engineering	42/58	MECH 340. Three exams with average grade of C- (60%) or better	71%
b1. An ability to design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specifications	45/50	MECH 440B. Individual written test plan with Pass/fail assessment by Advisor	90%
b2. An ability to conduct experiments, as well as analyze and interpret data	49/58	MECA 380. Lab assignments with Overall lab grade C+ or better	84%
c1. An ability to design a mechanical system, component, or process to meet desired needs	42/58	MECH 340. Individual design project with a grade of C or better	72%
c2. An ability to design a thermal system, component, or process to meet desired needs	65/66	MECH 338. Two design projects with at least 70% on one of the two	98%
d. An ability to function effectively as members of multidisciplinary teams	15 (F14) 35/35 (S15)	CIVL 495. Presentation, memorandums with 70% or better	100% (F14) 100% (S15)
	51/51	MECH 440A. Individual in group project with Faculty Advisor observation	100%
e1. An ability to define engineering problems	51/51	MECH 440A. Project definition assignment with Pass/fail assessment by Advisor	100%
e2. An ability to solve engineering problems	27/29	MECA 482 with a total score of at least 57 out of 95 points	93%
f. An understanding of professional ethical responsibility	15/15 (F14) 35/35 (S15)	CIVL 495. Presentation, memorandums with Score of 7 or better out of 10	100% (F14) 100% (S15)
g1. An ability to communicate technical matters effectively in oral form	51/51	MECH 440A Individual design project presentation with Pass/fail assessment	100%
g2. An ability to communicate technical matters effectively in written form	44/58	MECH 340 Individual design project reports achieving C or better	76%

g3. An ability to communicate technical matters effectively in graphical form	42/58	Drawings in MECH 340 Individual design report achieving C or better	71%
h. The broad education necessary to understand the impact of engineering solutions in a global and societal context	15/15 (F14) 35/35 (S15)	CIVL 495 Reports, instructor observation with Score of 7 or better out of 10	100% (F14) 100% (S15)
i A recognition of the need for, and an ability to engage in, life-long learning	15/15 (F14) 35/35 (S15)	CIVL 495 Reports, instructor observation with Score of 7 or better out of 10	100% (F14) 100% (S15)
j. A knowledge of contemporary issues	14/15 (F14) 35/35 (S15)	CIVL 495 Reports, instructor observation with Score of 7 or better out of 10	93% (F14) 100% (S15)
k. *An ability to use the techniques, skills, and modern mechanical engineering tools necessary for engineering practice*	57/63	MECH 306 Test questions pass/failure assessment by instructor	90%
	55/58	MECH 308 Final project with Pass/fail assessment by instructor	95%
	52/58	MECA 380 Programming assignments (x3) with at least 2 achieving 70% or better	90%

3.4 Assessment Data Summaries

The data collected from designated courses taught in fall 2014 and spring 2015 are summarized in the following table.

Table 2. Percentage of students failing to achieve student learning outcomes

Program Outcome	Course	Assessment Instrument	Demonstration of basic competency above a minimum grade or score	Number of MENG majors FAILING to demonstrate basic competency / Number of MENG majors enrolled (%)	
				Fall 2014	Spring 2015
a	MECH 340	Exams (x3)	Average grade of C-(60%) or better	*not taught*	16/58 (28%)
b1	MECH 440B	Individual written test plan	Pass/fail assessment by Advisor	*not taught*	5/50 (10%)
b2	MECA 380	Lab assignment reports	C+ grade or better	*not taught*	9/58 (16%)
c1	MECH 340	Individual design project	Average of C or better	*not taught*	16/58 (28%)
c2	MECH 338	Design problems (×2)	At least 70% on one of the two	*not taught*	1/66 (2%)
d	CIVL 495	Reports, instructor observation	Score of 70% or better	0/15 (0%)	0/35 (0%)
	MECH 440A	Individual function in group project	Pass/fail Faculty assessment by Advisor	0/51 (0%)	*not taught*
e1	MECH 440A	Problem definition in report	Pass/fail assessment	0/51 (0%)	*not taught*
e2	MECA 482	Exams and design/build/test of a mini project	At least 57 out of 95 total points	2/29 (7%)	*not taught*
f	CIVL 495	Reports, instructor observation	Score of 7 or better out of 10	0/15 (0%)	0/35 (0%)
g1	MECH 440A	Presentation in design review	Pass/fail assessment	0/51 (0%)	*not taught*
g2	MECH 340	Writing in design project written summary	C or better	*not taught*	14/58 (24%)
g3	MECH 340	Drawings in design report	C or better	*not taught*	16/58 (28%)
h	CIVL 495	Reports, instructor observation	Score of 7 or better out of 10	0/15 (0%)	0/35 (0%)
i	CIVL 495	Reports, instructor observation	Score of 7 or better out of 10	0/15 (0%)	0/35 (0%)

j	CIVL 495	Reports, instructor observation	Score of 7 or better out of 10	1/15 (93%)	0/35 (0%)
k	MECH 306	Tests on interpolation and integration	Pass/fail assessment by instructor	6/63 (10%)	*not taught*
	MECH 308	FEA in design report	Pass/fail assessment by instructor	*not taught*	3/58 (5%)
	MECA 380	Three lab assignments using LabVIEW	At least two assignments ≥ 70%	*not taught*	6/58 (10%)

The assessment results serve to identify the relative weakness of student learning in defined outcomes. As indicated in Table 1, students achieved more than 90% on 15 of the 19 outcomes, and greater than 80% in 16 of the outcome measurements. The lowest four outcomes were outcomes "a", "g2", and "g3". The score on outcome "a" disagrees with the exit survey that students were confident in their ability to apply math and science skills to engineering. These are the only areas that the achievement rate of the students was less than 80%.

Table 2 lists the percentage of students who failed to achieve an embedded outcome. A failure rate of 28% (16 out of 58 students) for outcomes "a", "c1" and "g3" and a rate of 24% (14 out of 58) for outcome "g2", all in MECH340 (Mechanical Engineering Design), raise serious concern of the measured abilities of our students. The measured abilities include "knowledge of math, science, and engineering", "design a mechanical system, component, or process to meet desired needs", "communicate technical matters effectively in written form", and "communicate technical matter effectively in graphical form". The results would need to be discussed by the faculty. These results are not consistent with the weaknesses in the program listed in the alumni and the graduating student surveys.

3.5 Summary of Senior Survey

The educational objectives were also topics on the graduating senior survey that are sent out to graduating students every spring. The survey is provided by the college office to the graduating students. The questions are broken into two categories_ the first pertains to a survey of the overall Chico State experience and the second pertains to the individual departments in the college.

The first list of questions in the survey has several questions that relate to the department. The surveys for last year had 37 students responding in 2014-2015. The questions in the survey were different in the previous years. Those questions include the following:

At Chico State, how satisfied were you with the... (2014 averages)

1. Quality of teaching by faculty in your department. (4.162)
2. Access to faculty in your department. (4.432)
3. Availability of courses in your department.(3.919)

4. Quality of courses in your department.(4.108)
5. Access to laboratory facilities and equipment.(3.784)
6. Quality of laboratories and equipment. (3.459)
7. Access to computer facilities. (3.919)
8. Quality of computer facilities.(3.297)
9. Academic advising from your major advisor. (3.973)
10. Career information from your department.(3.622)
11. The overall quality of your education. (4.162)
12. Your overall experience at Chico State. (4.351)

The results of the student evaluation of the mechanical engineering department, faculty, curriculum, and laboratory facilities illustrates that the strengths of the department are access to faculty in the department, the quality of courses in the department, and the quality of teaching in the department. The weaknesses in the department program are the quality of computing facilities, quality of laboratories, and career information from the faculty. These strengths and shortcomings were discussed with the department faculty in department meetings. We requested and received new computers and tables for the computing lab and redesigned the laboratory space for more efficient pedagogy in computing courses. We also decided to add additional courses for both fall and spring semesters.

The second set of questions is supplemental questions that relate to our programs educational objectives and student learning outcomes. Examples of questions related to student learning outcomes are listed below: (Note: the scale is 1: Very Unprepared to 5: Very Prepared)(Note: 37 students answered the survey in 2014-2015)

Based on your educational experience here at Chico State how well prepared are you to… ... (2014 averages)

1. Apply knowledge of math, science, and engineering. (4.405)
2. Design and execute test procedures (for equipment/hardware components or software). (4.189)
3. Analyze, assess, and interpret data/results from test procedures (4.243)
4. Design a component or system to meet desired needs (4.297)
5. Function in a multidisciplinary team. (4.486)
6. Identify, formulate and solve technical problems. (4.378)
7. Communicate technical matters in writing. (4.108)
8. Communicate technical matters orally. (4.189)
9. Understand and apply professional and ethical principles. (4.243)
10. Understand contemporary issues facing society (4.000)
11. Use modern tools and technology. (4.324)
12. Appreciate impact of your solutions on society and environment. (4.297)
13. Continue learning. (4.611)

The results from the survey show that the students feel the most qualified to continuous learning, work in multifunctional teams, and identify/formulate/solve technical problems. All of the questions had an average rating above 4.0, and thus the students feel prepared to enter the professional engineering workforce. The results of the survey were discussed with faculty at the department meetings. The faculty agreed that we were weak in computer facilities and expect the new computers will resolve the issue.

3.6 Alumni Survey

The degree to which the program educational objectives are attained is assessed by gathering data about alumni and alumnae after they leave the university. This is accomplished by periodically providing surveys to alumni, alumnae, and their employers. The alumni survey, is designed to elicit information regarding attainment of the program educational objectives, as well as career related information. Trends and patterns can emerge to relate the educational objectives and engineering performance of graduates.

The educational objectives and student learning outcomes were also topics on an alumni survey that was sent out to alumni periodically. The survey was sent to an alumni list provided by the development officer of the college. Twenty six alumni responded to the email request. The questions are as follows with the average for each item listed.

In February of 2015, during Career Day at Chico State, employers had an opportunity to set up a display booth for students to review their company. The students talk to potential employers and provide resumes to the companies for job openings.

Ten representatives from separate companies evaluated out student learning outcomes and provided comments about the importance of the outcomes. The representatives agreed with our student learning outcomes and rated them with high and medium importance. They also suggested that they would like to hire individuals with well-defined technical writing skills (Outcome g1); knowledge of HVAC (Outcome e1), Fluid Mechanics (Outcome e1), and AutoCad (Outcome g3); good communication skills (Outcome g1 and g2); multitasking and trouble shooting skills (Outcome e1); and knowledge of safety and project management (Outcome e1).

The evaluations from industry representatives were discussed with faculty during a spring department meeting. The student learning outcomes were not modified due to the positive responses from industry representatives.

The student learning outcomes were also reviewed with engineers, an engineering manager, and an owner of an electromechanical engineering company, Joy Signal Inc. The company generates $8 million income per year and produces electrical connectors for inspection machines of computer hardware. They have 45 employees in Chico, CA. The president of the company and five of his engineers reviewed the mechanical engineering student learning outcomes and offered some suggestions for improvement.

They also reviewed with some of the engineering faculty the qualities and skills that are desirable in a mechanical engineering graduate for their company. They recommended that we add configuration management to the CAD class, project management to the capstone senior project class, and additional math synthesis skills to the design classes.

Joy Signal engineers agreed with the student learning outcomes and rated the following as high priority: knowledge of mathematics, science, and engineering; conduct experiments and interpret data; define and solve engineering problems; communicate technical matters effectively in written form; engage in life-long learning; and use of techniques, skills, and modern mechanical engineering tools.

Alumni Survey April 2015

A. Name_____
_____
B. Degree Major: _ Mechanical Engineering _____
C. Year graduated: _____1967-2014_____
D. Company name currently working ____Many_____
E. Current job title: _____Many_____
F. Length of time working as an engineer (average years) :
_____16.94_____
Do you have a graduate degree? __Yes- 7 masters with two PhD's_____

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

1. Apply knowledge of mathematics, science, and engineering. Score: _4.50__
2. Design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specification. Score: _3.50_
3. Conduct experiments, as well as analyze and interpret data. Score: _3.81_
4. Design a mechanical system/ component/process to meet need. Score: _4.00
5. Design a thermal system, component, process to meet needs. Score: _4.17_
6. Function effectively as members of multidisciplinary teams. Score: _4.50
7. Define engineering problems. Score: _4.17_
8. Solve engineering problems. Score: _4.42_
9. Understand professional ethical responsibility. Score: _4.35_
10. Communicate technical matters effectively in oral form. Score: _4.40_
11. Communicate technical matters effectively in written for. Score: _4.06
12. Communicate technical matters effectively in graphical for. Score: _4.10
13. Understand the impact of engineering solutions in a global and societal context. Score: _3.27_
14. Recognize the need for, ability to engage in, life-long learning. Score: _3.91
15. Understand contemporary issues. Score: 3.64
16. Use the techniques, skills, and modern mechanical engineering tools necessary for engineering practice. Score: 4.07
17. Enter the engineering workplace or company. Score: 4.12

Other needed student learning outcomes.

1. ___project management, pneumatics,

2. ____ *supply chain, process technology,* _____
3. _____*salesmanship, marketing, conflict resolution* ___

Comments

1. The technical side of the education was excellent._____
2. CSUC Chico provided a well-rounded education _____
3. I felt I could have been better prepared for is the production planning portion of manufacturing engineering
4. Need more courses in Management / performance coaching, work with the generational gap _____

The survey was completed by 23 men and three women who are graduates from the mechanical engineering program at Chico State. The range of experience as an engineer ranged from 1 year to 42 years with an average of 16.94 years. Nine graduates of the program have advanced degrees including two PhD's. Two have professional licenses as mechanical engineers. The respondents rated the following three areas as the best prepared from their education: "*Apply knowledge of mathematics, science, and engineering*," "*Function effectively as members of multidisciplinary teams*," and "*Communicate technical matters effectively in oral form."* The respondents rated the following three areas as the least prepared from their education: "*Design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specification*," "*Understand the impact of engineering solutions in a global and societal context*," and "*Recognize the need for, ability to engage in, life-long learning*." The alumni and alumnae rated all of the items with a score above 4.0 except the three lowest plus "*Conduct experiments, as well as analyze and interpret data,"* and "*Recognize the need for, ability to engage in, life-long learning*."

3.8 Student Evaluation of Teaching (SET)

The mandatory student evaluation of teaching is given to students for spring semester courses. The SET questionnaire contains ten categories to evaluate the course. Each of the ten categories has a list of questions that relate to class organization, instructor preparation, instructor teaching techniques, and student preparation to name a few. The ten sets of questions are listen in the Appendix.

The average ratings for eight of the ten categories for MMEM courses for fall 2014 and spring 2015 are listed in Figures 1 and 2. The rating scale is 1 to 5 with 5 being most effective.

The results show that the top three categories of instruction for the department is the "Instructor Communication", "Faculty/Student Interaction", and "Instructional Methods and Materials." The lowest scoring categories were "Student Effort and Involvement", "Overall Evaluation", and "Course Outcome." The information was shared with faculty and will be discussed in future department meetings.

4. Program Improvement Recommendations

4.1 Annual Program Improvement Report

The results from the student learning outcomes, graduating senior survey, alumni survey, and SET results can offer some areas of improvement for the mechanical engineering program.

The embedded assessment results of the student learning outcomes identified three areas out of 19 that had a passing rate of lower that 82%. The lowest four outcomes were outcomes "a- math and science skills", "c1- design of a mechanical system", "g2- written communication skills", and "g3- graphical communication skills."

A failure rate of in outcome "a" raises the concern of math and science skills of our students. This is consistent with low scores from previous years. The math and science skills are taught in courses from the Math, Chemistry, and Physics Departments. We will discuss the results with faculty in the department meetings and look for ways to include more assignments and discussions on solving math and science intensive engineering problems.

A high failure rate for written and graphical communication raises several concerns is surprising and was not identified in previous years. We will review the results with faculty and review the embedded assessment assignments to be sure they are similar to assessments in the past. These results are not consistent with the weaknesses in the program listed in the alumni and the graduating student surveys.

The results of the graduating senior surveys of the mechanical engineering department, faculty, curriculum, and laboratory facilities illustrates that the strengths of the department are access to faculty in the department, the quality of courses in the department, and the quality of teaching in the department. The weaknesses in the department program are the quality of computing facilities, quality of laboratories, and career information from the faculty. We have made changes to the computer labs and the instructional labs to improve the computer and laboratory equipment.

The results from the alumni survey found that our graduates are very well prepared to enter the mechanical engineering careers. The alumni and alumnae rated all of the items in the survey with a score above 4.0 except "*Conduct experiments, as well as analyze and interpret data,"* and "*Recognize the need for, ability to engage in, life-long learning*." We do introduce the students to experiment practice but not experimental design. If the faculty determines in the faculty meetings that we need a class in design of experiments, we can in the future offer a design of experiment class as a technical elective. Dr. Greene has industrial experience using Taguchi Design of Experiments and has taught a class in it for the Sustainable Manufacturing Program. That is better handled by employers who use design of experiments in their industrial practice.

4.2 Faculty

Although the majority of student written comments and the evaluations from the SET are fairly positive, there is a wide range of rating distribution in the “Course Outcomes” and “Overall Evaluation Categories” in the SET. Teaching effectiveness tools can be discussed with faculty during faculty meetings and with Retention-Tenure Promotion (RTP) for the new faculty. The faculty and department chair should find ways to minimize he negative effects of student learning.

4.3 Curriculum

The curriculum can be modified to improve student learning. One of the comments in the senior exit survey for 2013-2014 was “The use of labs and team projects is what has helped me understand the material.” We have added the courses every semester to improve the course availability for the students.

The lowest scoring classes, MECH 208 and MECA 380 can be modified to add a laboratory or activity section in addition to the lecture portion of the class. This can help emphasize key components of the curriculum and provide a practicum for the students. This can help address the educational concerns identified by some students. The course load for faculty and other administrative items would need to be considered to offer additional classroom time for the Faculty.

Although the majority of student written comments and the evaluations from the SET are fairly positive, there is a wide range of rating distribution in the “Course Outcomes” and “Overall Evaluation Categories” in the SET. Teaching effectiveness tools can be discussed with faculty during faculty meetings and with Retention-Tenure Process (RTP) for the new faculty. The faculty and department chair should find ways to minimize he negative effects of student learning.

4.4 Student Outcome Assessment for CIVL 495

The student learning outcome assessment data from CIVL 495 was only recently available for this academic year (2014-2015). Missing assessment data from the previous years hindered the assessment of some learning outcomes and the improvement for the mechatronic engineering program. The Dean’s office will need to provide pressure to the Civil Engineering Department to continuously comply with the assessment plans of programs in the college.

Appendices

Mechanical Engineering Program Outcome Record Sheet

Mechatronic Engineering Program Outcome Record-Sheet

Course:	MECH 340 - Mechanical Engineering Design	**Semester:**	Spring 2014
Program Outcome:	a. An ability to apply knowledge of mathematics, science, and engineering	**Instructor:**	Dr. Engineering

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

How instruments are used to measure achievement of program outcome:	1	if the sum of the three in-class examinations was greater than or equal to 60% of the maximum points possible then the student achieved the program outcome.
	2	
	3	
	4	
	5	
	6	

Number of ME students in class achieving program outcome:	24	80%
Number of ME students in class not achieving program outcome:	6	20%

Comments on the suitability of the instruments used to measure achievement of the program outcome:
The inclass examinations are excellent instruments to measure the achievement of this program outcome.

Suggestions for possible changes of how achievement of the program outcome can be measured:
In the future this method could be used to indicate if a student passed or failed the class.

Suggestions for improving the program:
None

Note: Shaded fields are to be fill-in.

Mechatronic Engineering Program Improvement Plan - Second Edition *18 of 31*

MECH 340 - Mechanical Engineering Design

Program Outcome:	a. An ability to apply knowledge of mathematics, science, and engi						
Student Name	**Instrument Number**						**Outcome achieved?**
	1	**2**	**3**	**4**	**5**	**6**	(Y or N)
	55	**75**	**35**				
Student 1	42	23.5	26				Y
Student 1	38	36	30				Y
Student 1	35	44	26				Y
Student 1	23	44	29				Y
Student 1	25	43	29				Y
Student 1	42	51	28				Y
Student 1	50	62.5	29				Y
Student 1	38	51	30				Y
Student 1	28	36	30				Y
Student 1	49	68	25				Y
Student 1	50	58	30				Y
Student 1	22		0				N
Student 1	50	66	28				Y
Student 1	15	0	1E-15				N
Student 1	35	17	20				N
Student 1	28	57	26				Y
Student 1	38	66	30				Y
Student 1	28	53	28				Y
Student 1	35		0				N
Student 1	30	45	16				Y
Student 1	22	49	30				Y
Student 1	45	33	25				Y
Student 1	33	64	28				Y
Student 1	50	55	26				Y
Student 1	26	63	27				Y
Student 1	26	5	24				N
Student 1	19	65	27				Y
Student 1	34	15	26				N
Student 1	28	70	30				Y
Student 1	24	52	20				Y
Student 1	19	53	22				Y

Graduating Senior Survey Instrument

CALIFORNIA STATE UNIVERSITY, CHICO

Back to Admin Home

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...	1 Very Dissatisified	2	3	4	5 Very Satisfied
Q15	1. Quality of teaching by faculty in your department	○	○	○	○	○
Q16	2. Quality of teaching by other faculty	○	○	○	○	○
Q17	3. Access to faculty in your department	○	○	○	○	○
Q18	4. Availability of courses in your department	○	○	○	○	○
Q19	5. Quality of courses in your department	○	○	○	○	○
Q20	6. Access to laboratory facilities and equipment	○	○	○	○	○
Q21	7. Quality of laboratories and equipment	○	○	○	○	○
Q22	8. Access to computer facilities	○	○	○	○	○
Q23	9. Quality of computer facilities	○	○	○	○	○
Q24	10. Academic Advising from your major advisor	○	○	○	○	○
Q25	11. Academic Advising from the University Advising Office	○	○	○	○	○
Q26	12. Career information from your department	○	○	○	○	○
Q27	13. Availability of General Education courses	○	○	○	○	○

Q28	14. Quality of General Education courses	○	○	○	○	○
Q29	15. The overall quality of your education	○	○	○	○	○
Q30	16. Your overall experience at Chico State	○	○	○	○	○

Program Outcomes Questions

		1	2	3	4	5
	Based on your educational experience here at Chico State, how well prepared are you to...	Very Unprepared				Very Prepared
Q31	17. Apply knowledge of math, science, engineering, or technology to solve problems	○	○	○	○	○
Q32	18. Design and execute test procedures (for equipment/hardware components or software)	○	○	○	○	○
Q33	19. Analyze, assess, and interpret data/results from test procedures	○	○	○	○	○
Q34	20. Design a component or system to meet desired needs	○	○	○	○	○
Q35	21. Function in a multidisciplinary team	○	○	○	○	○
Q36	22. Identify, formulate and solve technical problems	○	○	○	○	○
Q37	23. Communicate technical matters in writing	○	○	○	○	○
Q38	24. Communicate technical matters orally	○	○	○	○	○
Q39	25. Understand and apply professional and ethical principles	○	○	○	○	○
Q40	26. Understand contemporary issues facing society	○	○	○	○	○
Q41	27. Use modern tools and technology	○	○	○	○	○
Q42	28. Appreciate impact of your solutions on society and environment	○	○	○	○	○
Q43	29. Continue learning	○	○	○	○	○
		1 Strongly Disagree	2	3	4	5 Strongly Agree
Q44	30. I would recommend my major program at CSU, Chico to others.	○	○	○	○	○

Page Break

31. Major: Q1

Please Select One...
APCG [APCG]
CINS [CINS]
CIMT [CIMT]
CIVL [CIVL]
CMGT [CMGT]
CMPE [CMPE]
CSCI [CSCI]
EENG [EENG]
MENG [MENG]
MECA [MECA]
SMFG [SMFG]
Other [Other]

32. Graduation Date

Semester Q2_1

2 3 4

Spring Summer Fall

Year Q2_2

2014 2014 2015 2015 2016 2016 2017 2017

33. Did you come to Chico State as a ... Q3

1 First-time freshman 2 Transfer

34. How many semesters did you attend Chico State? Q4

1 1-3 2 4-6 3 7-9 4 10-12 5 13+

35. What is your Overall GPA? Q5

1 Below 2.25
2 2.25-2.49
3 2.50-2.74
4 2.75-2.99
5 3.00-3.24
6 3.25-3.49
7 3.50-3.74
8 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? Q6

1 Did not have internship, co-op, or job
2 Very Valuable
3 Valuable
4 Somewhat Valuable
5 Not Valuable

37. If you were involved in any student/professional society, activities, or clubs, how valuable was the experience? Q7

1 Was not involved in societies, activities, or clubs
2 Very Valuable
3 Valuable
4 Somewhat Valuable
5 Not Valuable

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

Attend graduate School Q8_1

1 Yes 2 No

Begin Working Q8_2

1 Yes 2 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? Q9

0 None 1 One 2 Two 3 Three 4 Four +

40. Do you currently have a job offer that you are likely to accept? Q10

1 Yes
2 No

Nested Question Group for Response [1] of question [Q10]
If 'Yes,' Please provide:
Company Name: Q10_1

You Have 50 Characters Remaining.

Your Job Title: Q10_2

You Have 50 Characters Remaining.

Starting annual Salary Q10_3

1 Less then $30k
2 $30k-$40k
3 $41k-$50k
4 $51k-$60k
5 $61k-$70k
6 $71k or more

41. If you interviewed through the campus Career Planning & Placement Office, how helpful was it? Q11

1 Did not interview through campus office
2 Very Helpful
3 Helpful
4 Somewhat Helpful
5 Not Helpful

42. If you found a job that you are likely to accept, how did you find it? Q12

1 Campus Career Planning & Placement Office
2 Faculty/department referral
3 Online Posting
4 Mailed resume
5 Personal Connections
6 Other

Nested Question Group for Response [6] of question [Q12]
Please Specify:
Q12_1

You Have 3500 Characters Remaining.

43. Did you take a comprehensive exam (FE, CMdgT, MFT or other) for your discipline? Q13

1 No, did not take
2 Yes, and passed
3 Yes and did not pass
4 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? Q14

1 Yes
2 No

Nested Question Group for Response [1] of question [Q14]
If 'Yes,' how valuable was the course? Q14_1

1 Very Valuable
2 Valuable

3 ○ Somewhat Valuable
4 ○ Not Valuable

Page Break

45. How satisfied are you with the department support you received while enrolled at Chico State? Q45

1 ○ Very dissatisfied
2 ○ Somewhat dissatisfied
3 ○ Neutral
4 ○ Somewhat satisfied
5 ○ Very satisfied

46. How often did you meet with someone in the University Advising Office? Q46

1 ○ More than once a semester
2 ○ Once a semester
3 ○ Once a year
4 ○ Less than once a year
5 ○ Never

47. How often did you meet with your major (departmental) advisor? Q47

1 ○ More than once a semester
2 ○ Once a semester
3 ○ Once a year
4 ○ Less than once a year
5 ○ Never

48. How has the quality of your educational experience varied over the time period you were enrolled at Chico State? Q49

1 ○ Quality improved significantly
2 ○ Quality improved somewhat
3 ○ Quality stayed fairly consistent
4 ○ Quality declined somewhat
5 ○ Quality declince considerably

49. Permanent e-mail Address (so we can keep in touch) Q50

You Have 3500 Characters Remaining.

Page Break

APCG Supplemental Questions

1. Do you feel you are prepared to pursue a career in the Computer Graphics industry? APCG_Q1

1 ○ Very unprepared

Page Break

EENG Supplemental Questions

In the Space provided, please provide additional comments regarding what you LIKED most about the program and what could be done to enhance it. EENG_Q1

You Have 3500 Characters Remaining.

Page Break

MENG Supplemental Questions

	Based on your educational experience at Chico State, how well prepared are you to:	1 Very Unprepared	2	3	4	5 Very Prepared
MENG_Q1	1. Communicate manufacturing needs, including tolerances, to a technician	○	○	○	○	○
MENG_Q2	2. Write verifiable engineering specifications based on customer needs	○	○	○	○	○
MENG_Q3	3. Create a Gantt chart for a project	○	○	○	○	○
MENG_Q4	4. Identify the critical path for a project	○	○	○	○	○
MENG_Q5	5. Develop a detailed project budget	○	○	○	○	○
MENG_Q6	6. Present information for a design review	○	○	○	○	○
MENG_Q7	7. Prepare and execute an experimental test plan	○	○	○	○	○
MENG_Q8	8. Select hardware and develop software for automated data collection	○	○	○	○	○
MENG_Q9	9. Analyze pressure drop and select a pump for a piping system	○	○	○	○	○
MENG_Q10	10. Select a material for a specific application	○	○	○	○	○
MENG_Q11	11. Use simulation software for stress or heat transfer analysis	○	○	○	○	○
MENG_Q12	12. Verify finite element analysis results through traditional analysis techniques	○	○	○	○	○
MENG_Q13	13. Solve equations using numerical techniques	○	○	○	○	○
MENG_Q14	14. Simulate or write equations of the performance of a system	○	○	○	○	○

Alumni Survey Instrument

Alumni Survey **April 2015**

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? _____

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 need. *Score: ___*

Design a thermal system, component, process to meet needs. *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 for. *Score: ___*

Communicate technical matters effectively in graphical for. *Score: ___*

Understand the impact of engineering solutions in a global and societal context. *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

_____

_____

Student Instructional Report (SIR II)

STUDENT INSTRUCTIONAL REPORT

Class Report
Subunit: ECC - Mech Engr, Mechatronic Engr, Manufact Tech
Course: Measurements and Instrumentation
Instructor:
Enrollment:
Survey Period: Spring 2012

SIR II™

Assessing Courses and Instruction

PERCENTAGES reported below are based on the total number responding, which is: 7*

A. Course Organization and Planning	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderatly Effective	2 Somewhat Ineffective	1 Ineffective	Mean
1. The instructor's explanation of the course requirements								
2. The instructor's preparation for each class period								
3. The instructor's command of the subject matter								
4. The instructor's use of class time								
5. The instructor's way of summarizing or emphasizing important points in class								
Overall Mean								

B. Communication	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderatly Effective	2 Somewhat Ineffective	1 Ineffective	Mean
6. The instructor's ability to make clear and understandable presentations								
7. The instructor's command of spoken English (or the language used in the course)								
8. The instructor's use of examples or illustrations to clarify course material								
9. The instructor's use of challenging questions or problems								
10. The instructor's enthusiasm for the course material								
Overall Mean								

C. Faculty/Student Interaction	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderatly Effective	2 Somewhat Ineffective	1 Ineffective	Mean
11. The instructor's helpfulness and responsiveness to students								
12. The instructor's respect for students								
13. The instructor's concern for student progress								
14. The availability of extra help for this class (taking into account the size of the class)								
15. The instructor's willingness to listen to student questions and opinions								
Overall Mean								

D. Assignments, Exams, and Grading	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderatly Effective	2 Somewhat Ineffective	1 Ineffective	Mean
16. The information given to students about how they would be graded								
17. The clarity of exam questions								
18. The exams' coverage of important aspects of the course								
19. The instructor's comments on assignments and exams								
20. The overall quality of the textbook(s)								
21. The helpfulness of assignments in understanding course material								
Overall Mean								

E. Instructional Methods and Materials	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderatly Effective	2 Somewhat Ineffective	1 Ineffective	Mean
22. Problems or questions presented by the instructor for small group discussions								
23. Term paper(s) or project(s)								
24. Laboratory exercises for understanding important course concepts								
25. Assigned projects in which students worked together								
26. Case studies, simulations, or role playing								
27. Course journals or logs required of students								
28. Instructor's use of computers as aids in instruction								
Means are not reported (***) for Instructional Methods								

F. Course Outcomes	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderatly Effective	2 Somewhat Ineffective	1 Ineffective	Mean
29. My learning increased in this course?								
30. I made progress toward achieving course objectives?								
31. My interest in the subject area has increased?								
32. This course helped me to think independently about the subject matter...								
33. This course actively involved me in what I was learning?								
Overall Mean								

G. Student Effort and Involvement	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderatly Effective	2 Somewhat Ineffective	1 Ineffective	Mean
34. I studied and put effort into the course?								
35. I was prepared for each class [writing and reading assignments]?								
36. I was challenged by this course?								
Overall Mean								

H. Course Difficulty, Work Load, and Pace	Omit	Very difficult	Somewhat difficult	About right	Somewhat elementary	Very elementary
37. For my preparation and ability, the level of difficulty of this course was?						
	Omit	Much heavier	Heavier	About the same	Lighter	Much lighter
38. The workload for this course in relation to other courses of equal credit was?						
	Omit	Very fast	Somewhat fast	Just about right	Somewhat slow	Very slow
39 . For me, the pace at which the instructor covered the material during the term was?						

I. Overall Evaluation	Omit	5 Very Effective	4 Effective	3 Moderatly Effective	2 Somewhat Ineffective	1 Ineffective	Mean
40. Rate the quality of instruction in this course as it contributed to your learning (try to set aside your feelings about the course content):							
Overall Mean							

J. Student Information	Omit	A major/ minor requirement	A college requirement	An elective	Other			
41. Which one of the following best describes this course for you?								
	Omit	Freshman-/1st year	Sophomore/2nd year	Junior/3rd year	Senior/4th year	Graduate	Other	
42. What is your class level?								
	Omit	Better in English		Better in another language		Equally well in English and another language		
43. Do you communicate better in English or another language?								
	Omit	Female		Male				
44. Sex								
	Omit	A	A-	B+	B	B-	C+	Below C
45. What grade do you expect to receive in this course?								

MMEM SET (SIRII) Results Summary for Spring 2015

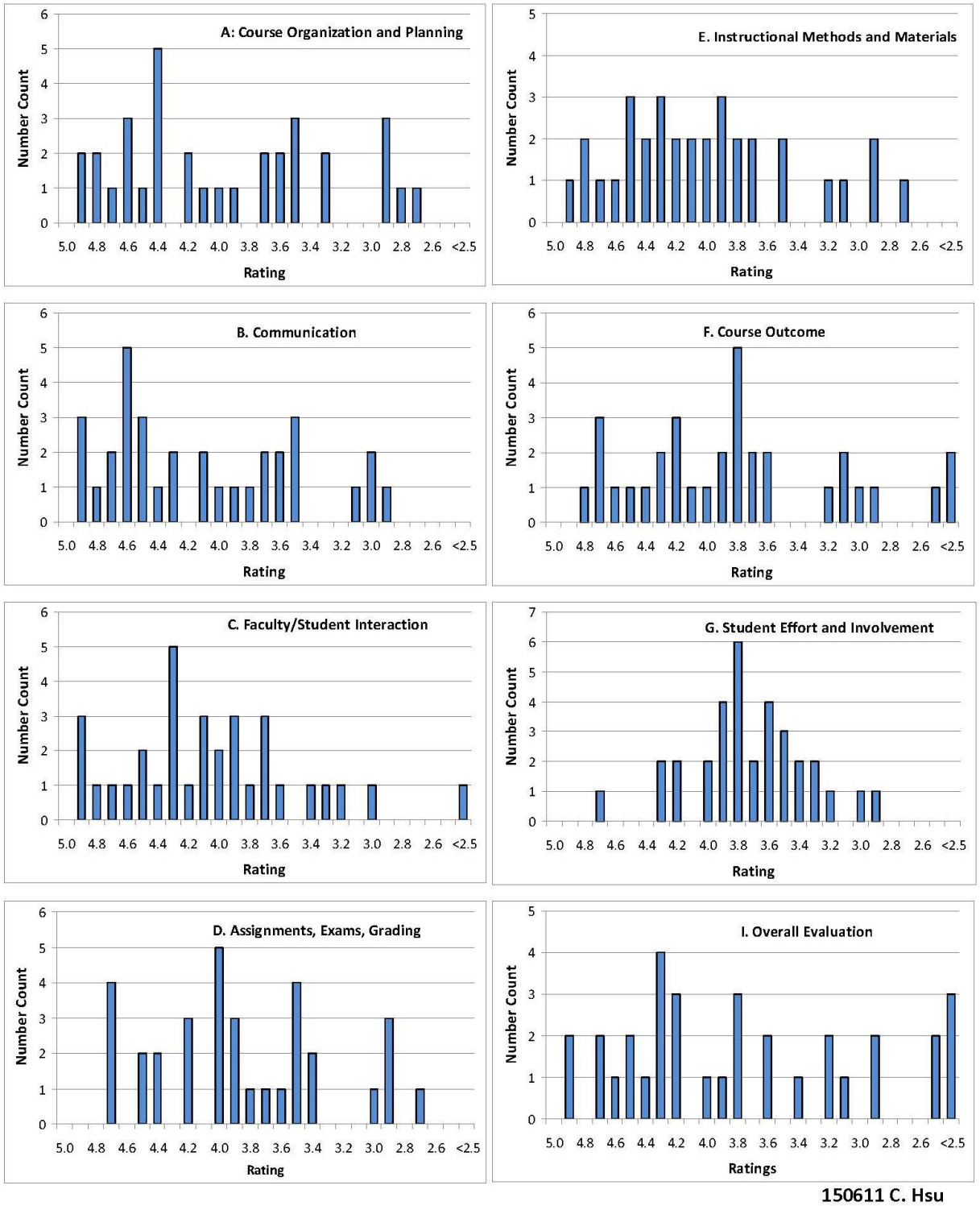

Figure 1 – MMEM rating summary by evaluation category of SET conducted in spring 2015.