

**Mechanical Engineering**  
**Annual Program Improvement Report**  
**2013-2014**

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## 1. INTRODUCTION

The *Mechanical Engineering Program Improvement Plan, edition 3* (August 23, 2012) documents the educational objectives, outcomes, and process to make improvements to the Program.

This document, the *Mechanical Engineering Annual Program Improvement Report*, provides a summary of findings and actions for the 2013-2014 academic year resulting primarily from the implementation of the *Mechanical Engineering Program Improvement Plan*. This report is divided into three main sections: actions taken in 2013-2014 to improve the Program, assessment data gathered in 2013-2014, and recommendations for improvements to the Program based on assessment results. While some detailed data are reported here, more complete data can be found in the assessment files in the file cabinet located in the Department storeroom (OCNL 436A) and in the MEMM Department folder on Chico State Bay server.

## 2. ACTIONS TAKEN IN 2013-2014 TO IMPROVE THE PROGRAM

### 2.1 Areas Recommended for Improvement in 2012-2013 Program Improvement Report

The 2012-2013 Annual Program Improvement Report identified five areas to consider for improvements. These areas are (a) faculty instructional effectiveness and consistency, (b) Fundamentals of Engineering (FE) exam participation, (c) curriculum, (d) Graduating Senior Survey and Student Evaluation of Teaching (SET) participation rates, and (e) student Program Outcomes assessment embedded in CIVL 495. Actions taken during 2013-2014 in the identified areas are summarized in the following.

#### 2.1.1. Faculty Instructional Effectiveness and Consistency

It was recognized in the 2012-2013 Program Improvement Report that the instructional effectiveness varied greatly among department faculty: there were good instructors providing laudable instruction while a couple of others were far below students' expectation.

This was not a new issue; it surfaced more frequently than the Department would like to see. The concern was again brought up to the faculty at a faculty meeting and the faculty was urged to always be attentive to classroom/lab instruction and interaction with students. At the same time, the Department Chair adjusted teaching assignments when resources permit.

There was only one written comment reported, rather than multiple in the year prior, in the Graduating Senior Survey conducted in spring 2014. Another indicator of teaching effectiveness lies in the Student Evaluation of Teaching (SET) which is conducted in nearly all classes. The SET is course-specific, more inclusive in participation, and direct in various aspects of teaching effectiveness.

Some results from the SET and Graduating Senior Survey conducted during 2013-2014 are summarized in Figures 1 and 2 and Table A. Rating distributions for two indicative areas of teaching effectiveness, *Course Outcomes* and *Overall Evaluation*, are shown in Figures 1 and 2, respectively. The collective result for the more pointed survey question of department faculty teaching quality (Question no.15) in comparison with those from prior years is summarized in Table A.

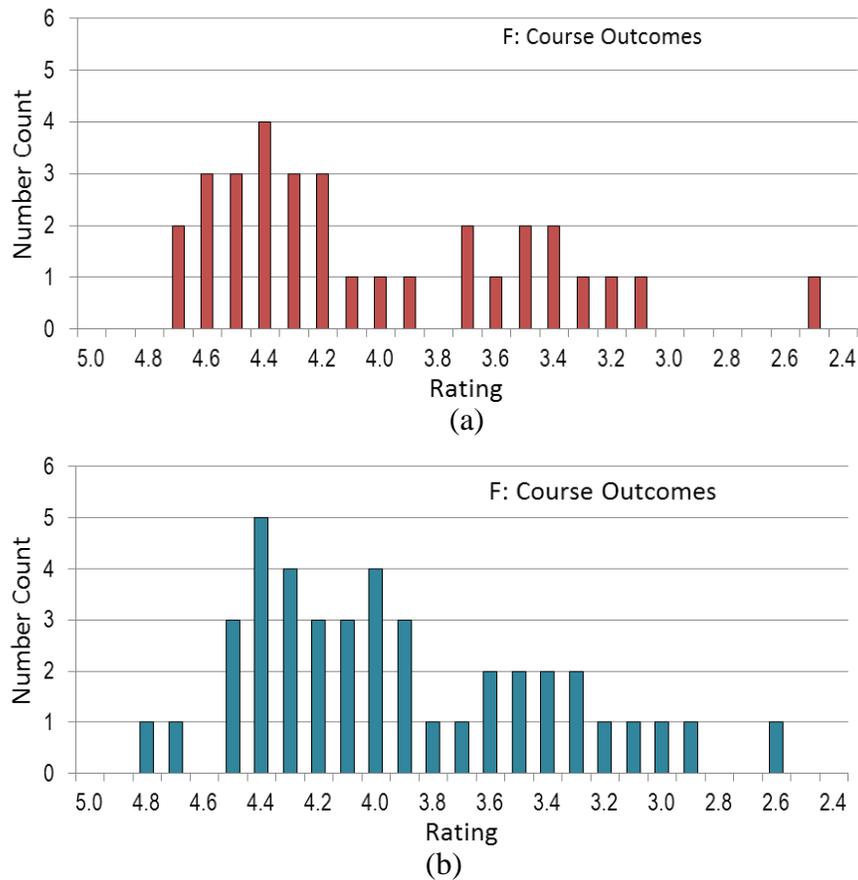


Figure 1 – Distribution of SET ratings for *Course Outcomes* of courses taught in (a) spring 2013 and (b) spring 2014. (Likert scale of 1-5 with 5 being very satisfied)

A new university policy was implemented in fall 2013 that the SET is required of classes with an enrollment of six (6) or more, in both fall and spring semesters. Prior to fall 2013, the SET was optional in the fall semester and mandatory in the spring semester. Although data for fall 2013 and spring 2014 semesters is available, only spring results are presented in Figure 1 for a fair comparison.

Figure 1 clearly exhibits the presence of unsatisfactory ratings (at 3.2 and lower) and a particularly low lone rating of 2.5 and 2.6. An encouraging observation is that more than 50% of classes receive ratings above 4.0 indicating an excellent teaching effectiveness of the majority of faculty.

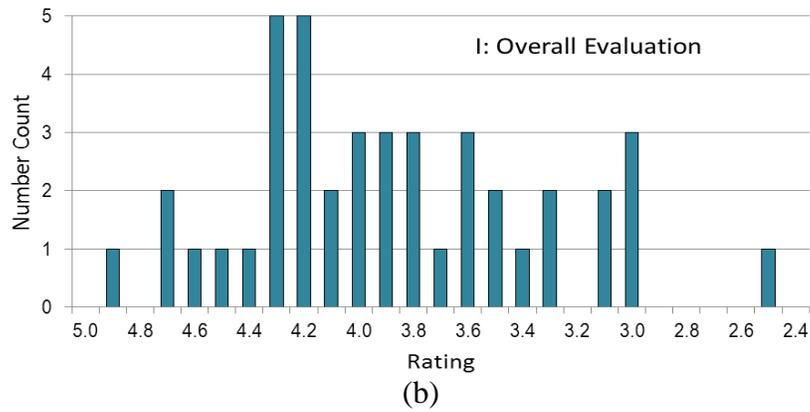
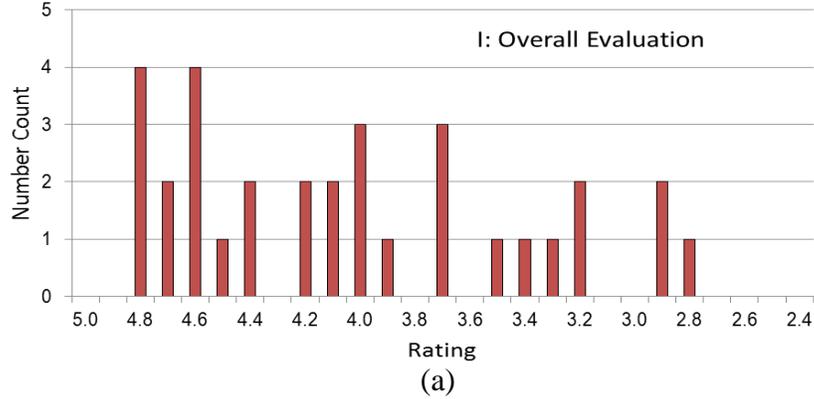


Figure 2 – Distribution of SET ratings for *Overall Evaluation* of courses taught in (a) spring 2013 and (b) spring 2014. (Likert scale of 1-5 with 5 being very satisfied)

Observations that can be made in Figure 2 are similar to those available in Figure 1: undesirable number of low ratings (<3.2) and excellent instructional quality (>4.0) in more than half of the classes taught.

Another indicator of faculty instructional quality, although not as course-specific as that in SET, can be gauged with the response to the survey question: “*Quality of teaching by faculty in your department.*” in the Graduating Senior Survey. Response means for this question from recent years are tabulated in Table A.

**Table A:** Averages of responses to the question on faculty teaching quality in 2010 to 2014 Graduating Senior Surveys. (Likert scale of 1-5 with 5 being very satisfied)

Question in Graduating Senior Survey	2010	2011	2012	2013	2014
Quality of teaching by faculty in your department. (Q15)	3.70	4.00	3.95	3.83	4.16

Table A shows a perceived improvement in teaching quality provide by the department faculty, after a three-year decline in rating, as responded by graduating seniors in the spring 2014 survey.

### 2.1.2 Fundamentals of Engineering (FE) Exam Requirement and Participation

Although the Mechanical Engineering faculty have voted unanimously to remove taking FE exam as a graduation requirement for Mechanical Engineering students starting in fall 2012, students were still encouraged to take the FE exam before graduating from Chico State.

Numbers of current Mechanical Engineering students who took the FE exam from October 2011 to spring 2014 are tabulated in Table B.

**Table B:** Number of Mechanical Engineering students took the FE exam from October 2011 to April 2013.

FE Exam Admin.	October 2011	April 2012	October 2012	April 2013	October 2013	Spring 2014
No. of Students Took FE Exam	17	31	12	19	26	1
Academic Year	2011-2012		2012-2013		2013-2014	
No. of Students Took FE During Academic Year	48		31		27	

Despite faculty encouragement, the number of students taking FE exam continued to decrease as it was no longer a requirement for graduation. It is foreseeable that the trend is likely to continue.

### 2.1.3 Curriculum

#### Lab experience

In the 2012-2013 Graduating Senior Survey, students expressed appreciation of the hands-on lab experience that contributes to their learning, particularly in MECH 308 (Finite Element Analysis) and MECA 482 (Control System Design). To enhance the benefit of hands-on lab experience, one option is to consider adding or restoring lab component to these classes.

With the new hiring in the last couple years confined to the other two programs (Sustainable Manufacturing and Mechatronic Engineering) in the Department, the size of the Mechanical Engineering faculty had remained nearly the same, making addition of lab in the instructional pattern not feasible. The hiring of a tenure-track faculty member, Dr. David Alexander, to start in fall 2014 will likely make the addition of lab component in MECH 308 and MECA 482 possible.

Since the proposal to make changes to the course instructional pattern needs to go through the required time-consuming campus process, a speedier approach was adopted to incorporate hands-on projects in MECH 308 and hardware-building activities in MECA 482.

### **Lab equipment upgrade**

As a result of diminishing state funding in recent years, department labs and equipment have gradually become outdated. Faculty was encouraged to be more creative in locating resources for equipment upgrades; the Student Learning Fee (SLE) and the Consolidated Course Fee are two possible campus resources.

Three proposals submitted in 2012-2013 were funded for \$22,150 and implemented in 2013-2014: *Universal Testing Machine Upgrade*, *Computing Cluster for Engineering Students*, and *Distributed/Remote Data Acquisition and Monitoring*. Two additional proposals intended for equipment enhancement, *Automatic Tool Measuring System for CNC Lathe* and *DC Power Supplies for Mechatronics Systems Lab*, were also funded for implementation in 2014-2015.

#### **2.1.4 Graduating Senior Survey and Student Evaluation of Teaching (SET) Participation Rates**

Student participation in the Graduating Senior Survey was again linked to MECH 440B in spring 2014 as recommended in the 2012-2013 Program Improvement Report, resulting in an 100% participation rate.

Faculty was urged to raise the student participation rate in SETs in their classes by (a) adopting the in-class paper SET which typically garners better participation or (b) reminding students more frequently to complete on-line questionnaire. However, an approach needs to be designed to identify classes adopting paper SET as the information was not provided in the report by the Institutional Research.

#### **2.1.5 CIVL 495 for Program Outcome Assessment**

The College Dean was enlisted to assist in the acquisition of the embedded learning outcome assessment data in CIVL 495 from the Department of Civil Engineering. Like what happened in the last few years, no useful assessment data was provided to the Mechanical Engineering program.

Faculty looked into the possibility of designating one or more MMEM courses for program outcomes assessments that were expected to be done in CIVL 495. No MMEM courses that would be as suitable as CIVL 495 for measurement of Program Outcomes d, f, h, I, and j were identified.

### **3. ASSESSMENT DATA GATHERED IN 2012-2013**

### 3.1 Embedded Assessment of Program Outcomes

Instruments and results of Program Outcomes assessment embedded in selected courses are summarized in Table C. A complete list of identified Program Outcomes can be found in Appendix A. Sample assessment record sheets are reproduced in Appendix B.

**Table C:** Methods and results of embedded Program Outcomes assessments for 2013-2014.

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 2013	Spring 2014
a	MECH 340	Exams (x3)	Average of 60% or better	<i>not taught</i>	9/53
b <sub>1</sub>	MECH 440B	Individual written test plan	Pass/fail assessment	<i>not taught</i>	4/45
b <sub>2</sub>	MECA 380	Lab assignment	C or better	<i>not taught</i>	5/54
c <sub>1</sub>	MECH 340	Individual design project	A grade of 60% or better	<i>not taught</i>	3/53
c <sub>2</sub>	MECH 338	Design problems (x2)	At least 70% on one of the two	<i>not taught</i>	12/64
d	CIVL 495			<i>no data</i>	<i>no data</i>
	MECH 440A	Individual in group project	Faculty advisor evaluation	1/45	<i>not taught</i>
e <sub>1</sub>	MECH 440A	Individual assignment	Pass/fail grading	0/45	<i>not taught</i>
e <sub>2</sub>	MECA 482	Six projects	All grades should be “Good” or “Acceptable”; no “Unacceptable”	14/46	<i>not taught</i>
f	CIVL 495			<i>no data</i>	<i>no data</i>
g <sub>1</sub>	MECH 440A	Individual final design review	Pass/fail assessment	0/45	<i>not taught</i>
g <sub>2</sub>	MECH 340	Individual design project memo	Grade of 60% or better	<i>not taught</i>	3/53
g <sub>3</sub>	MECH 340	Design project drawings	A grade of 60% or better	<i>not taught</i>	3/53
h	CIVL 495			<i>no data</i>	<i>no data</i>
i	CIVL 495			<i>no data</i>	<i>no data</i>
j	CIVL 495			<i>no data</i>	<i>no data</i>
k	MECH 306	Five (x5) sets of 10 questions	At least 4 scores are above 66%, 66%, 100%, 100%, 60% , respectively	8/61	<i>not taught</i>
	MECH 308	Final open-ended project	Pass/fail assessment	<i>not taught</i>	6/69
	MECA 380	Programming assignments (x3)	All 17/23, 17/23, 17/20 or better	<i>not taught</i>	4/54

The majority of assessment results are acceptable, except the failure rate for Program Outcome e<sub>2</sub> conducted in MECA 482 reaches 30% (14 of 46) which is unreasonably high and should be looked into to identify the underlying causes.

Instructors for courses selected for embedded assessments also reported the suitability evaluation of their assessment instruments, and suggestions for improving assessment instruments and the Mechanical Engineering program. Their input by Program Outcome and course is collected in Table D.

**Table D:** Suitability of assessment instruments and suggestions for improving assessment instruments and Mechanical Engineering program based on 2013-2014 Program Outcomes assessment results.

Program Outcome	Course	Suitability of Assessment Instrument	Suggestions for Assessment Instrument	Suggestions for Program Improvement
a	MECH 340	Excellent	None suggested	None suggested
b <sub>1</sub>	MECH 440B	Suitable	None suggested	None suggested
b <sub>2</sub>	MECA 380	Suitable, but no ideal	Use individual design projects	Acquire more lab equipment
c <sub>1</sub>	MECH 340	Excellent	Include peer evaluation	None suggested
c <sub>2</sub>	MECH 338	Suitable	None suggested	Split the class into two sections to improve classroom instruction and learning
d	CIVL 495	Not assessed	None suggested	None suggested
	MECH 440A	Suitable	None suggested	None suggested
e <sub>1</sub>	MECH 440A	Suitable	None suggested	None suggested
e <sub>2</sub>	MECA 482	Suitable	Focus on individual hardware project; better structured projects	Need a control system lab with redesigned reliable experiments; Better integration of theoretical and hands-on projects.
f	CIVL 495	Not assessed	None suggested	None suggested
g <sub>1</sub>	MECH 440A	Suitable	None suggested	No suggestions based current data
g <sub>2</sub>	MECH 340	Excellent	Add peer evaluation	None suggested
g <sub>3</sub>	MECH 340	Excellent	Add graphical communication with a 3D printer	None suggested
h	CIVL 495	Not assessed	None suggested	None suggested
i	CIVL 495	Not assessed	None suggested	None suggested
j	CIVL 495	Not assessed	None suggested	None suggested
k	MECH 306	Suitable	Change criteria to “at least 3 of the 5 tests” achieving specified % to pass the assessment	None suggested
	MECH 308	Sufficient	None suggested	None suggested
	MECA 380	Suitable	None suggested	None suggested

All current assessment instruments were suitable as reported by instructors of designated courses in Table D. There were also a couple suggestions for assessment instruments and program improvement. These suggestions should be referenced by the instructors of MECA 380, MECH 340, and MECA 482 in 2014-2015.

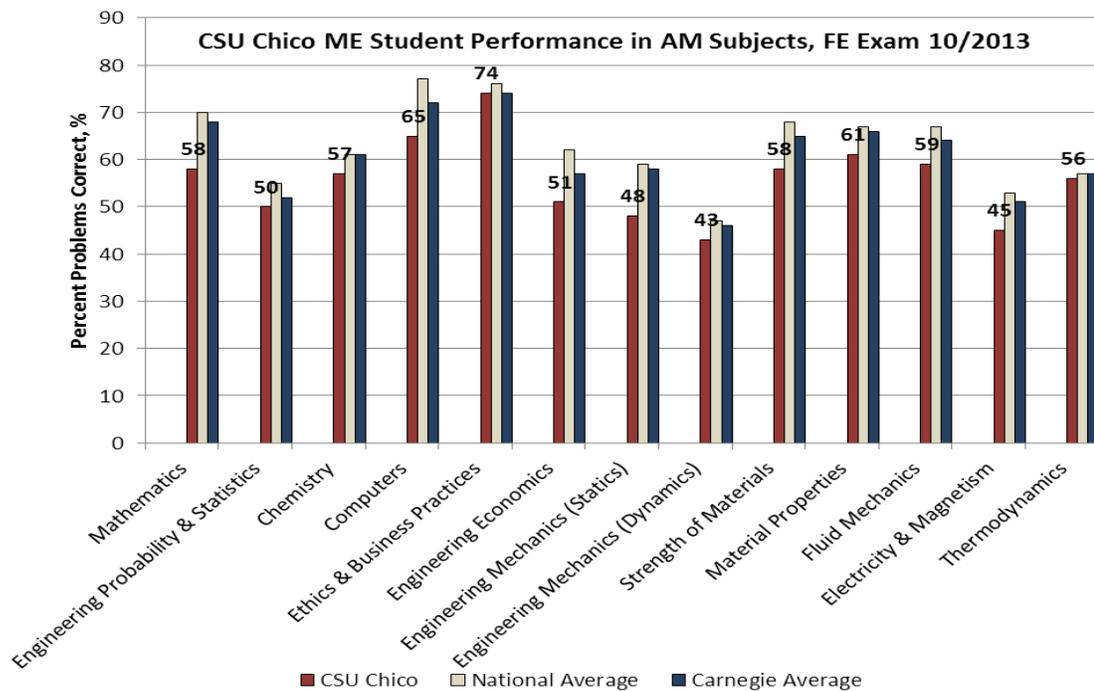
### 3.2 Fundamentals of Engineering (FE) Exam

The performance of CSUC Mechanical Engineering majors at the Fundamentals of Engineering (FE) exam at the October 2013 administration is summarized in Tables E where comparisons are also made with national and Carnegie 3 Universities' averages. The results from online spring 2014 exams are not presented in this report for there was only one student took the exam and the results were not representative.

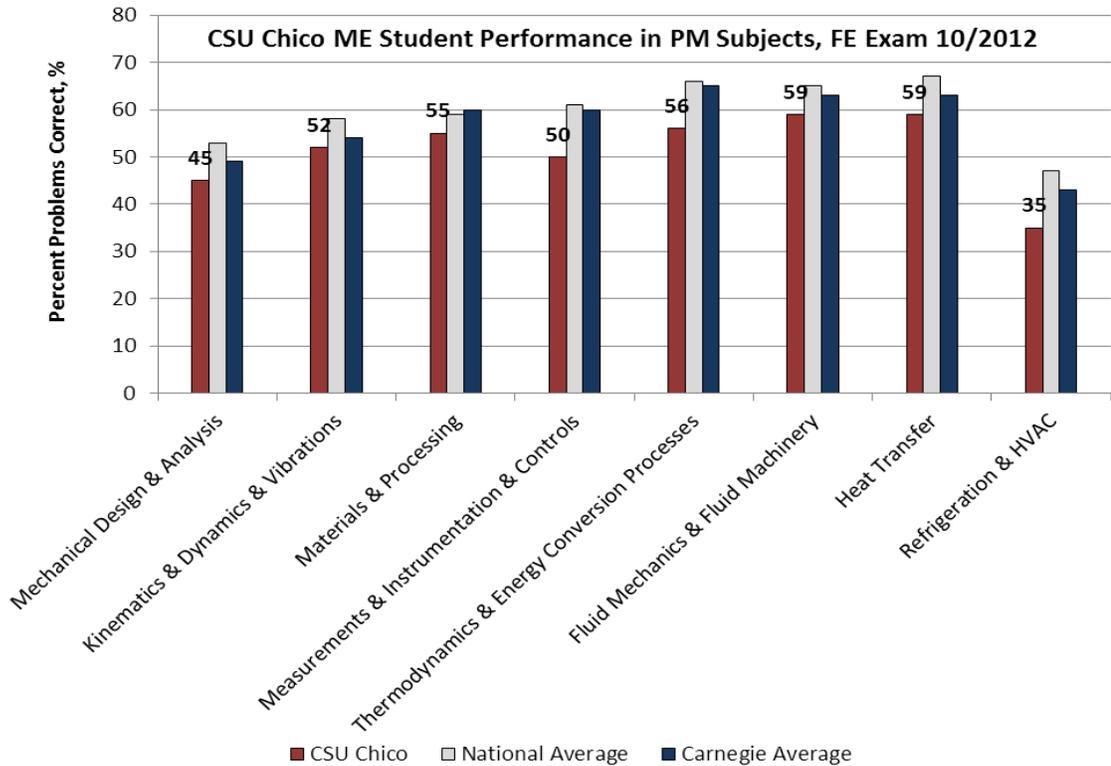
**Table E:** Pass-rates in the Mechanical Engineering specific and general PM exams for Mechanical Engineering students who were enrolled at CSUC when taking the exams in the October 2013 ET administration.

Institution	Percent Students Took ME-Specific PM Exam	Pass-rate
CSUC	96% (n=25)	52%
National Average	88%	79%
Carnegie 3 Average	76%	74%
Percent Students Took General PM Exam		Pass-rate
CSUC	4% (n=1)	0%
National Average	12%	69%
Carnegie 3 Average	24%	74%

Performance in subject areas in the general AM and Mechanical Engineering-specific PM sessions of the October 2013 FE exam for CSUC Mechanical Engineering students is summarized in Figure 3(a) and (b), respectively. It should be noted that starting in fall 2012, the taking of FE exam would no longer be a graduation requirement for CSUC Mechanical Engineering students.



(a)



(b)

**Figure 3-** FE exam performance by subject area in (a) the AM session and (b) PM session of Mechanical Engineering majors who were enrolled in CSUC when taking the October 2013 FE.

As indicated in Figure 3, CSUC Mechanical Engineering student scored roughly the same as National and Carnegie 3 averages, although slightly lower in most subject areas at the October 2013 administration. Nonetheless, it is clear that CSUC Mechanical Engineering students were not as proficient in *Mathematics, Computers, Engineering Economics, Engineering Mechanics (Statics), and Strength of Materials* of AM session, and in *Measurements & Instrumentation & Controls* and *Refrigeration & HVAC* of the PM session.

The performance summary of CSUC Mechanical Engineering majors in the general PM afternoon exam session is not documented in this report for there was only one student took the October 2013 administration.

### 3.3 Graduating Senior Survey

In spring 2014 an anonymous online survey of graduating Mechanical Engineering seniors was conducted. The survey targeted students enrolled in MECH 440B – Mechanical Engineering Design Project II as it is a required course and is typically taken by seniors shortly before graduation. The survey questionnaires are reproduced in Appendix C. The survey questions can be grouped into areas relating to (1) demographics and post-graduate plans (which will not be discussed further in this report), (2) educational satisfaction, (3)

educational outcomes, (4) project management skills, and (5) other outcomes. Responses of the Mechanical Engineering majors who participated in the survey are summarized in the following.

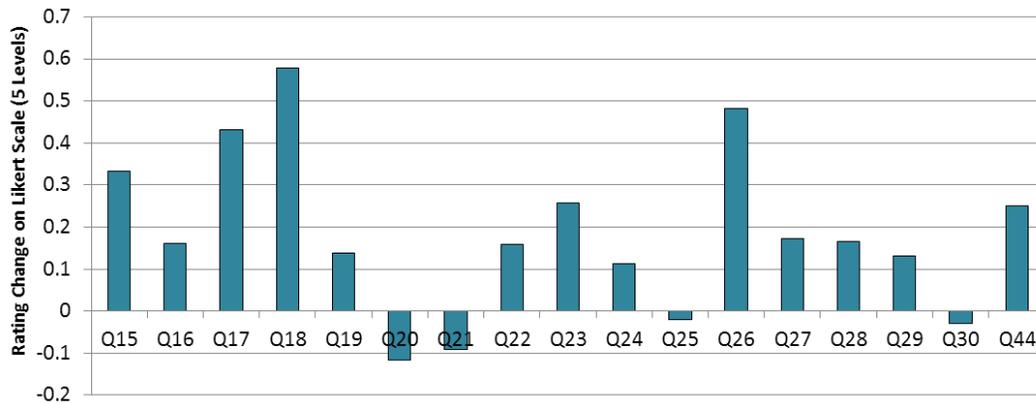
### 3.3.1 Educational Satisfaction

Survey results on educational satisfaction from 2008 to 2013 and changes from 2012 to 2013 are summarized in Table F and Figure 5, respectively.

**Table F:** Means of responses to survey questions regarding Educational Satisfaction

(5 level Likert scale: 1 = very dissatisfied and 5 = very satisfied; for question 44 only, 1 = strongly disagree and 5 = strongly agree.)

No.	At Chico State, how satisfied were you with the . . .	2009	2010	2011	2012	2013	2014
Q15	Quality of teaching by faculty in your department	3.75	3.70	4.00	3.95	3.83	4.16
Q16	Quality of teaching by other faculty	3.63	3.60	3.45	3.48	3.59	3.75
Q17	Access to faculty in your department	4.19	4.10	4.27	4.41	4.00	4.43
Q18	Availability of courses in your department	2.81	3.13	3.52	3.70	3.34	3.92
Q19	Quality of courses in your department	3.69	3.62	3.88	4.14	3.97	4.11
Q20	Access to lab facilities and equipment	3.75	3.38	3.97	3.68	3.90	3.78
Q21	Quality of laboratories and equipment	3.25	3.35	3.70	3.73	3.55	3.46
Q22	Access to computer facilities	4.13	3.87	4.15	3.66	3.76	3.92
Q23	Quality of computer facilities	3.41	3.30	3.27	3.05	3.04	3.30
Q24	Academic advising from your major advisor	3.84	3.60	3.94	3.98	3.86	3.97
Q25	Academic advising from the Advising Office	3.13	3.32	3.24	3.18	3.21	3.19
Q26	Career information from your department	2.77	2.80	3.36	3.37	3.14	3.62
Q27	Availability of GE courses	3.69	3.65	3.45	3.59	3.34	3.51
Q28	Quality of GE courses	3.13	3.20	2.85	3.05	2.97	3.14
Q29	Overall quality of your education	3.88	3.90	4.18	4.18	4.03	4.16
Q30	Your overall experience at Chico State	4.16	4.20	4.30	4.18	4.38	4.35
Q44	I would recommend my major at CSU, Chico to others	4.22	4.08	4.39	4.30	4.34	4.60



**Figure 4:** Changes of responses to survey questions regarding educational satisfaction from 2012 to 2013.

According to Table E and Figure 4, in the spring 2014 survey, questions directly related to educational satisfaction had more favorable results comparing with those in the spring 2013 survey. In particular, Questions 18 and 26 on *Availability of courses in your department* and *Career information from your department*, respectively, saw the greatest improvement. On the other hand, Questions 20 and 21 on *Quality of laboratories and equipment* and *Quality of laboratories and equipment*, respectively, suffered a slight downturn.

It should be noted that Mechanical Engineering graduating seniors would be more likely to recommend Chico State's Mechanical Engineering program to others (average rating of 4.60 for Q44, the highest in recent years).

### 3.3.2 Educational Outcomes

Response means for survey questions relating to educational outcomes are tabulated in Table G. Note that the Q-questions (Q31 to Q43) are common survey questions for all ECC graduating seniors while S-questions (S1 to S18) are supplemental survey questions for Mechanical Engineering graduating seniors.

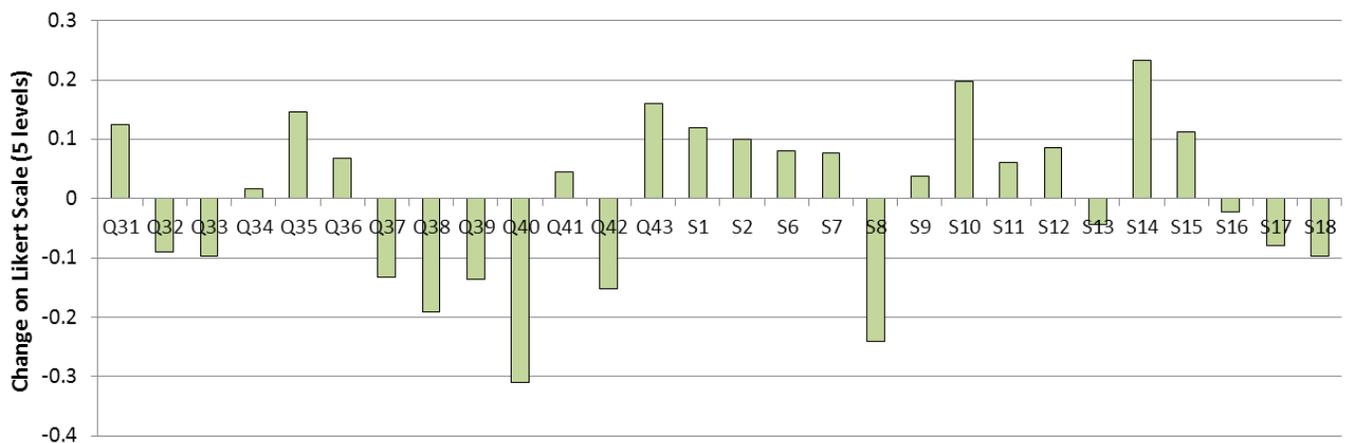
In the spring 2012 survey, the Mechanical Engineering specific supplemental questions were revised to better survey a broader range of learning outcomes. The same questionnaires were adopted again in the spring 2013 and spring 2014 surveys, making the comparison possible over the last three years. Changes in the surveyed areas from 2013 to 2014 are summarized in Figure 5.

**Table G:** Means of responses to survey questions relating to Educational Outcomes  
(5 level Likert scale: 1 = very unprepared and 5 = very well prepared)

No.	Based on your educational experience here at Chico State, how well prepared are you to ...	2009	2010	2011	2012	2013	2014
Q31	Apply knowledge of math, science, engineering, or technology to solve problems	4.13	4.15	4.36	4.43	4.28	4.41
Q32	Design and conduct experiments	3.69	3.80	4.15	4.36	4.28	4.19
Q33	Analyze and interpret data	4.03	3.93	4.21	4.30	4.34	4.24
Q34	Design a component or system to meet desired needs	4.31	4.25	4.36	4.34	4.28	4.30
Q35	Function on a multidisciplinary team	4.28	4.42	4.36	4.39	4.34	4.49
Q36	Identify, formulate, and solve technical problems	4.31	4.30	4.33	4.36	4.31	3.38
Q37	Communicate technical matters in writing	3.94	3.82	4.27	4.07	4.24	4.11
Q38	Communicate technical matters orally	3.94	3.95	4.27	4.11	4.38	4.19
Q39	Understand & apply professional & ethical principles	4.35	3.80	4.21	4.07	4.38	4.24
Q40	Understand contemporary issues facing society	3.84	3.70	3.82	4.02	4.31	4.00
Q41	Use modern tools and technology	4.03	3.85	4.06	4.16	4.28	4.32
Q42	Enter the workplace ( <i>I</i> )	3.90	3.77	4.15	4.30	4.45	4.30
Q43	Continue learning	4.25	4.36	4.48	4.52	4.45	4.61
S1	Communicate manufacturing needs to a technician	<i>no data</i>		4.30	4.02	4.07	4.19
S2	Write verifiable engineering specifications based on customer needs	<i>not surveyed</i>			4.30	4.39	4.49

S6	Present information for a design review	<i>no data</i>	4.21	4.21	4.46	4.54
S7	Prepare and execute an experimental plan	<i>no data</i>	4.21	4.23	4.22	4.30
S8	Select hardware and develop software for automated data collection	<i>not surveyed</i>		3.60	3.89	3.65
S9	Analyze pressure drop and select a pump for a piping system	<i>not surveyed</i>		4.12	4.07	4.11
S10	Select a material for a specific application	<i>not surveyed</i>		4.30	4.18	4.38
S11	Use simulation software for stress or heat transfer analysis	<i>not surveyed</i>		4.29	4.21	4.27
S12	Verify finite element analysis results through traditional analysis techniques	<i>not surveyed</i>		4.05	4.32	4.41
S13	Solve equations using numerical techniques	<i>not surveyed</i>		4.19	4.07	4.03
S14	Simulation or write equations of the performance of a system	<i>not surveyed</i>		4.00	3.93	4.16
S15	Select machine parts and lubrication for a particular application	<i>not surveyed</i>		3.77	3.86	3.97
S16	Analyze a thermal problem and select a suitable heat exchanger or heat sink	<i>not surveyed</i>		4.47	4.32	4.30
S17	Solve a heat transfer problem using thermal resistances	<i>not surveyed</i>		4.53	4.43	4.35
S18	Select a motor for a particular application	<i>not surveyed</i>		3.77	3.61	3.51

(I) Question number 42 is not a defined Student Learning Outcome.



**Figure 5:** Changes of responses to survey questions relating to Educational Outcomes from spring 2013 to spring 2014.

Table F shows that, of the surveyed educational outcome areas, 2013-2014 graduating Mechanical Engineering seniors were most confident in “*Enter the workforce* (Q35, rating 4.49)”, “*Continue earning* (Q43, rating 4.61)”, “*Present information for a design review* (S2, rating 4.49)”, and “*Present information for a design review* (S6, rating 4.54)”.

By average ratings below 4.00, 2013-2014 graduating seniors were not as confident about their ability to “*Identify, formulate, and solve technical problems* (Q36, rating 3.38)”, “*Select hardware and develop software for automated data collection* (S8, rating 3.65)”, “*Select machine parts and lubrication for a particular application* (S15, rating 3.97)”, and “*Select a motor for particular application* (S18, rating 3.51)”. However, Q15 saw a continuous improvement from 2012 (first time surveyed) to 2014.

Impressively, the confidence of 2013-2014 graduating seniors was the highest since 2009 in the following areas:

- S2: Write verifiable engineering specifications based on customer needs (rating 4.49)
- S6: Present information for a design review (4.54 rating)
- S7: Prepare and execute an experimental plan (4.30 rating)
- S10: Select a material for a specific application (4.38 rating)
- S12: Verify finite element analysis results through traditional analysis techniques (4.41 rating)
- S14: Simulation or write equations of the performance of a system (4.16 rating)
- S15: Select machine parts and lubrication for a particular application (3.97 rating)

As shown in Figure 5, the most improved areas from spring 2013 to spring 2014 surveys were:

- S10: Select a material for a specific application (+0.20)
- S14: Simulation or write equations of the performance of a system (+0.23)

The areas suffered the most decline are:

- Q38: Communicate technical matters orally (-0.19)
- Q40: Understand contemporary issues facing society (-0.31)
- S8: Select hardware and develop software for automated data collection (-0.24)

### 3.3.3 Project Management Skills

Average responses to questions on management skills are tabulated in Table H.

**Table H:** Means of responses to survey questions relating to Project Management skills. (5 level Likert scale: 1 = very unprepared and 5 = very well prepared)

No.	Based on your educational experience here at Chico State, how well prepared are you to	2009	2010	2011	2012	2013	2014
S3	Create a Gantt chart for a project	<i>no data</i>		3.91	3.93	4.04	4.05
S4	Identify the critical path for a project	<i>no data</i>		4.09	4.26	4.25	4.41
S5	Develop a detailed project budget	<i>no data</i>		4.18	4.12	4.18	4.27
Overall Average		<i>no data</i>		4.06	4.10	4.16	4.24

As can be seen in Table H, ratings for all three areas of project management skills in spring 2014 survey were the highest since 2011. Table H also show that the overall rating average continued to rise from 4.06 in 2011 to 4.24 in 2014 suggesting an increased confidence of Mechanical Engineering graduates in project management skills.

### 3.3.4 Written Comments

Parts of written responses to the open-ended question “please provide additional comments that will help faculty to improve the quality of the education they provide” in the Mechanical Engineering supplemental questions are categorized and summarized in the following. The comments presented here are direct quotes, including spelling and grammatical errors.

### Courses

- “I felt the MECHA 380 class should be reorganized. I did not personally learn much in the class. The selected text book was horrible that coupled with a subpar instruction in the class ... ”
- “My education was amazing at Chico State. Improvements could be made in the areas of teaching GD&T, controls implementation, and programming in different languages. In general, I found MECA 380 to be a repeat of much of the material taught in controls ”
- “The classes that involve learning a programming language (matlab,labview) need some work. I dont know if they were just taught poorly or if they were taught like we should already know how to program ..... ”
- “numerical methods class could be taught better along with measurement”
- “As an engineering student I feel like we have to take too much lower division GE courses (econ and the like) ”
- “Matlab, Measurement (Labview), and Control system 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. ”
- “Really enjoyed the teaching here at chico state. My biggest complaint is that the unit count is getting dropped and the classes they are cutting are engineering classes. should cut ge classes. those are so pointless. “

### Instruction

- “To whom it may concern I have had an awesome experience attending Chico State. I have had amazing instructors, incredible collaboration options, descent labs, and an extremely supportive department. .... ”
- “..... I personally had a great education experience with ..... ”
- “I believe that the faculty make the courses more hands on and provide more examples rather than teaching the “book” to the class. I am an interactive learner ..... ”

### Faculty

- “The faculty at Chico State did an amazing job preparing me for my future in the workplace.”

- “I am very pleased with my experience here. All of the professors are very nice, and approachable for any manner. I will for sure be telling future high school grads to go to get their mechanical engineering degree through Chico.”
- “For the most part the faculty was really good at teaching the subject, however there are a few teachers that i feel need improvement.”

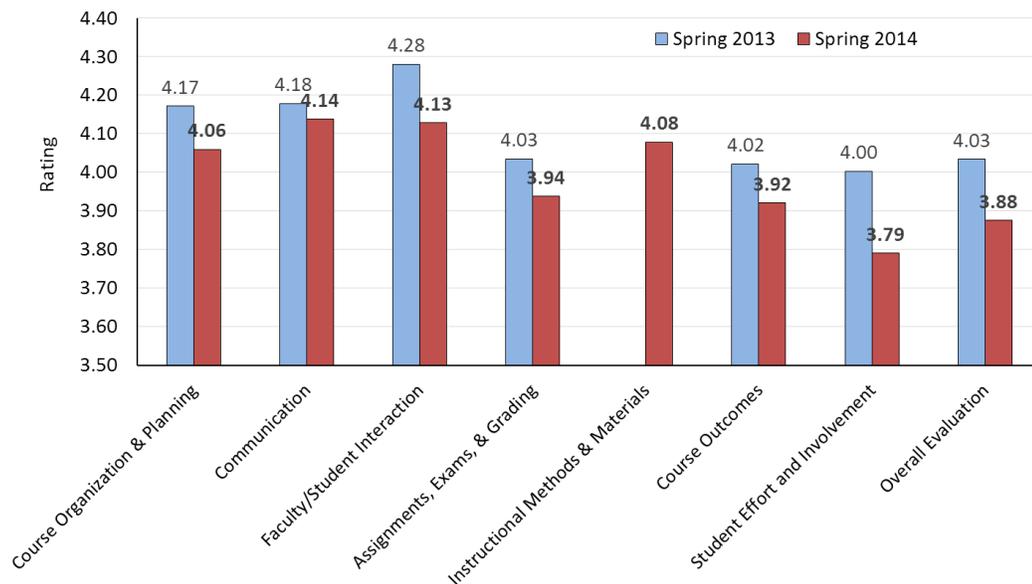
### Lab Experience

- “The use of labs and team projects is what has helped me understand the material. Not all courses offer something like this, and that is the reason I struggled in those courses. Projects and team work early in the college career is something that can help ..... ”

### 3.4 Student Evaluation of Teaching (SET)

Starting in fall 2013, the Student Evaluation of Teaching (SET) would be required of classes with an enrollment of six (6) or more in both fall and spring semesters. The SET adopted SIRII questionnaire focusing on ten categories that each contained a set of related questions. These ten categories and related questions are duplicated in Appendix E. Result of the spring 2014 SET for the Department can be found in Appendix F.

Here rating averages for seven evaluation categories in spring 2013 SET and eight categories from spring 2014 for MEM courses are summarized in Figure 6. The remaining categories did not generate quantifiable for evaluation purpose.



**Figure 6** – Rating averages for SET evaluation categories from spring 2013 and spring 2014. The rating scale is 1 to 5 with 5 being the “most effective”.

As can be seen in Figure 6, comparing to spring 2013, the spring 2014 ratings were lower in all categories, except “*Instructional Methods & Materials*” for which no quantifiable data was reported in spring 2013.

The highest rating average in the spring 2014 SET was 4.28 in “*Communication*”, and the lowest was 3.79 in “*Student Effort and Involvement*”. Distribution of course ratings within these two categories are shown in Figure 7.

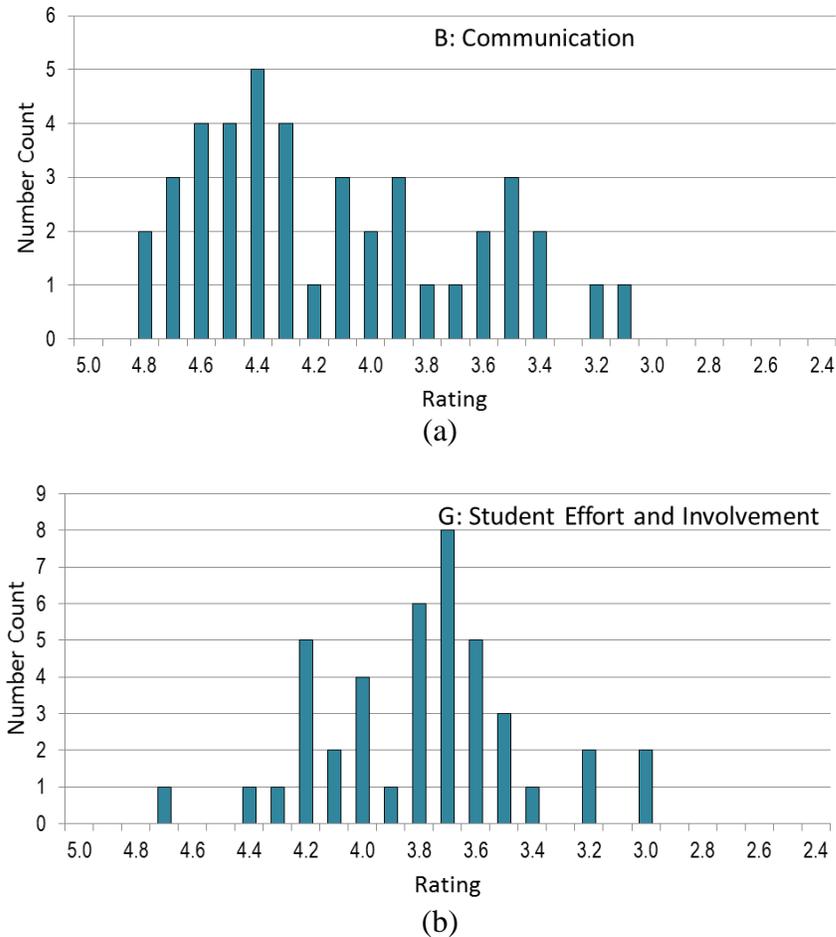


Figure 7 – Rating distributions for evaluation categories of *Communication* and *Student Effort and Involvement* in the spring 2014 SET.

The category of “*Student Effort and Involvement*” posted the greatest decline, in addition to having the lowest rating average, among the eight categories summarized in Figure 6. Two other categories, “*Faculty and Student Interaction*” and course “*Overall Evaluation*” also suffered significant decline at  $-0.15$  both.

## 4. RECOMMENDATIONS

### 4.1 Faculty

Although the majority of the student written comments in the Graduating Senior Survey and responses in the SET were fairly positive, there was still wide rating distribution in *Course Outcomes*, 2.6 to 4.8, and *Overall Evaluation*, 2.5 to 4.9, of the spring 2014 SET, Appendix F. As this is not a new concern, faculty and the Department Chair should find a way to reduce the gap and to minimize the negative impact on student learning.

## **4.2 Fundamentals of Engineering (FE) Exam**

Since its deletion in fall 2012 as a graduation requirement, the number of students taking the FE exam and their pass rate continued to decrease. Faculty would need to decide whether to stop using the FE exam as a learning outcome assessment tool. In the meantime, students should still be encouraged to take the FE exam before leaving Chico. The FE exam preparation workshops should continue.

## **4.3 Curriculum**

### **4.3.1 Courses**

There were students concerns about the course content and instructional approach of MECH 208 and MECA 380. Faculty and the Department Chair would need to review the content and teaching of both courses.

### **4.3.2 Lab and equipment upgrade**

Some progress was made in this academic year in upgrading lab equipment with successful Student Learning Fee proposals. The department faculty should be encouraged to continue with the effort.

## **4.4 Graduating Senior Survey and Student Evaluation of Teaching (SET)**

An excellent participation rate of Mechanical Engineering graduating seniors in the ECC Graduating Senior Survey was achieved by linking it to the MECH 440B class. The practice should be continued. Faculty should also be encouraged to adopt the in-class paper SET for an improved participation rate.

## **4.5 Program Outcomes Assessment Embedded in CIVL 495**

The assessment data from CIVL 495 for Mechanical Engineering (MECH) Program Outcomes, and those for all other engineering programs in the College of ECC, from the Civil Engineering (CIVL) Department continued to be a challenge. As the CIVL Department had had no interest in complying with the assessment practice and the MECH faculty considered (a) implementing the assessments in MECH courses and (b) removing CIVL 495 from the MECH curriculum not feasible as short-term solutions, the faculty would need to continue to work to find a solution.

## Appendix A

### Statement of Mechanical Engineering Student Learning Outcomes\*

*Mechanical Engineering Program graduates must have:*

- a. An ability to apply knowledge of mathematics, science, and engineering*
- b<sub>1</sub>. An ability to design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specifications*
- b<sub>2</sub>. An ability to conduct experiments, as well as analyze and interpret data*
- c<sub>1</sub>. An ability to design a mechanical system, component, or process to meet desired needs*
- c<sub>2</sub>. 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<sub>1</sub>. An ability to define engineering problems*
- e<sub>2</sub>. An ability to solve engineering problems*
- f. An understanding of professional ethical responsibility*
- g<sub>1</sub>. An ability to communicate technical matters effectively in oral form*
- g<sub>2</sub>. An ability to communicate technical matters effectively in written form*
- g<sub>3</sub>. 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*

\* From Mechanical Engineering Program Improvement Plan, edition 2 (October 23, 2008)

## Appendix B

### Sample Student Learning Outcome Assessment Record Sheet

**Mechanical Engineering Program Outcome Record-Sheet**

<b>Course:</b>		<b>Semester:</b>	
<b>ME Program Outcome:</b>		<b>Instructor:</b>	
<b>Description of instruments used in this course to measure attainment of program outcome:</b>	1		
	2		
	3		
	4		
	5		
	6		

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

<b>Number of ME students in class achieving program outcome:</b>	0	#DIV/0!
<b>Number of ME students in class not achieving program outcome:</b>	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.*



## Appendix C

### ECC Graduating Senior Survey Instrument Spring 2014

## 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

1. Major:

2. Graduation Date

Semester

Spring  Summer  Fall

Year

2011  2012  2013  2014

3. Did you come to Chico State as a ...

First-time freshman  Transfer

4. How many semesters did you attend Chico State?

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

5. 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

6. 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

7. 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

8. 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.

9. How many job offers have you received?

None  One  Two  Three  Four +

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

Yes

No

11. 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

12. 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

13. 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

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

Yes

No

Next

For Survey Content Questions,  
contact Lynn Abbiati: [labbati@csuchico.edu](mailto:labbati@csuchico.edu)

For Technical Questions,  
contact Paul Weatherby: [pweatherby@csuchico.edu](mailto:pweatherby@csuchico.edu)

Educational Satisfaction Questions

At Chico State, how satisfied were you with the...

	Very Dissatisfied				Very Satisfied
15. Quality of teaching by faculty in your department	<input type="radio"/>				
16. Quality of teaching by other faculty	<input type="radio"/>				
17. Access to faculty in your department	<input type="radio"/>				
18. Availability of courses in your department	<input type="radio"/>				
19. Quality of courses in your department	<input type="radio"/>				
20. Access to laboratory facilities and equipment	<input type="radio"/>				
21. Quality of laboratories and equipment	<input type="radio"/>				
22. Access to computer facilities	<input type="radio"/>				
23. Quality of computer facilities	<input type="radio"/>				
24. Academic Advising from your major advisor	<input type="radio"/>				
25. Academic Advising from the University Advising Office	<input type="radio"/>				
26. Career information from your department	<input type="radio"/>				
27. Availability of General Education courses	<input type="radio"/>				
28. Quality of General Education courses	<input type="radio"/>				
29. The overall quality of your education	<input type="radio"/>				
30. Your overall experience at Chico State	<input type="radio"/>				

Program Outcomes Questions

Based on your educational experience here at Chico State, how well prepared are you to...

	Very Unprepared				Very Prepared
31. Apply knowledge of math, science, engineering, or technology to solve problems	<input type="radio"/>				
32. Design and conduct experiments	<input type="radio"/>				
33. Analyze and interpret experimental data	<input type="radio"/>				
34. Design a component or system to meet desired needs	<input type="radio"/>				
35. Function in a multidisciplinary team	<input type="radio"/>				
36. Identify, formulate and solve technical problems	<input type="radio"/>				
37. Communicate technical matters in writing	<input type="radio"/>				
38. Communicate technical matters orally	<input type="radio"/>				
39. Understand and apply professional and ethical principles	<input type="radio"/>				
40. Understand contemporary issues facing society	<input type="radio"/>				
41. Use modern tools and technology	<input type="radio"/>				
42. Appreciate impact of your solutions on society and environment	<input type="radio"/>				
43. Continue learning	<input type="radio"/>				
	Strongly Disagree				Strongly Agree
44. I would recommend my major program at CSU, Chico to others.	<input type="radio"/>				

[Next](#)

For Survey Content Questions,  
contact Lynn Abbiati: [labbati@csuchico.edu](mailto:labbati@csuchico.edu)

For Technical Questions,  
contact Paul Weatherby: [pweatherby@csuchico.edu](mailto:pweatherby@csuchico.edu)

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

- Very dissatisfied
- Somewhat dissatisfied
- Neutral
- Somewhat satisfied
- Very satisfied

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

- More than once a semester
- Once a semester
- Once a year
- Less than once a year
- Never

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

- More than once a semester
- Once a semester
- Once a year
- Less than once a year
- Never

48. How would a requirement for your major to purchase a laptop have impacted your decision to come to Chico State?

- Would not have impacted my decision to come
- Minor financial difficulty, but I would have still come
- Major financial difficulty, but I would have still come
- May have prevented me from coming
- Would have definitely prevented me from coming

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

- Quality improved significantly
- Quality improved somewhat
- Quality stayed fairly consistent
- Quality declined somewhat
- Quality decline considerably

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

You Have 3500 Characters Remaining.

For Survey Content Questions,  
contact Lynn Abbiati: [labbati@csuchico.edu](mailto:labbati@csuchico.edu)

For Technical Questions,  
contact Paul Weatherby: [pweatherby@csuchico.edu](mailto:pweatherby@csuchico.edu)

# Appendix D

## Mechanical Engineering Specific Supplemental Survey Questions

### ECC Graduating Senior Survey Spring 2014



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[Reset Survey](#)

### 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	<input type="radio"/>				
2. Write verifiable engineering specifications based on customer needs	<input type="radio"/>				
3. Create a Gantt chart for a project	<input type="radio"/>				
4. Identify the critical path for a project	<input type="radio"/>				
5. Develop a detailed project budget	<input type="radio"/>				
6. Present information for a design review	<input type="radio"/>				
7. Prepare and execute an experimental test plan	<input type="radio"/>				
8. Select hardware and develop software for automated data collection	<input type="radio"/>				
9. Analyze pressure drop and select a pump for a piping system	<input type="radio"/>				
10. Select a material for a specific application	<input type="radio"/>				
11. Use simulation software for stress or heat transfer analysis	<input type="radio"/>				
12. Verify finite element analysis results through traditional analysis techniques	<input type="radio"/>				
13. Solve equations using numerical techniques	<input type="radio"/>				
14. Simulate or write equations of the performance of a system	<input type="radio"/>				
15. Select machine parts and lubrication for a particular application	<input type="radio"/>				
16. Analyze a thermal problem and select a suitable heat exchanger or heat sink	<input type="radio"/>				
17. Solve a heat transfer problem using thermal resistances	<input type="radio"/>				
18. Select a motor for a particular application	<input type="radio"/>				
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.

## Appendix E

### Student Evaluation of Teaching (SET) Instrument Spring 2014

# STUDENT INSTRUCTIONAL REPORT



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

## 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 Moderately 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								
<b>Overall Mean</b>								

B. Communication	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderately 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								
<b>Overall Mean</b>								

C. Faculty/Student Interaction	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderately 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								
<b>Overall Mean</b>								

D. Assignments, Exams, and Grading	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderately 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								
<b>Overall Mean</b>								

E. Instructional Methods and Materials	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderately 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								
<b>Means are not reported (***) for Instructional Methods</b>								

F. Course Outcomes	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderately 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?								
<b>Overall Mean</b>								

G. Student Effort and Involvement	Omit	Not Applicable	5 Very Effective	4 Effective	3 Moderately 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?								
<b>Overall Mean</b>								

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 Moderately 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):							
<b>Overall Mean</b>							

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?								

## Appendix F

### Summary of MECH-MECA Student Evaluation of Teaching (SET) Data Spring 2014

## MMEM SET (SIR II) Results Summary Spring 2014

