

Mechanical Engineering
Annual Program Improvement Report
2010-2011

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1. INTRODUCTION

The *Mechanical Engineering Program Improvement Plan, edition 2* (October 23, 2008) 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 2010-2011 academic year resulting primarily from the implementations of the *Mechanical Engineering Program Improvement Plan*. This report is divided into three main sections: actions taken in 2010-2011 to improve the Program, assessment data gathered in 2010-2011, 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 on the on-line Vista MMEM Resources Community.

2. ACTIONS TAKEN IN 2010-2011 TO IMPROVE THE PROGRAM

2.1 Areas Recommended for Improvement in 2009-2010 Annual Improvement Report

The 2009-2010 Annual Program Improvement Report identified three areas to consider for improvements. These areas are faculty performance, curriculum changes, and program outcome assessment process. Actions taken during 2010-2011 in the recommended areas are described in the following.

2.1.1. Faculty

Sub-areas recommended for improvement in the faculty satisfaction in the 2009-2010 Annual Program Improvement Report include instructional quality, quality of courses, career information from the Department, and students' willingness to recommend Mechanical Engineering program at CSU, Chico to others. Satisfaction with the identified sub-areas had a continuous declining trend in recent years. There were not specific actions recommended in the 2009-2010 Annual Program Improvement Report for improving the aforementioned sub-areas of faculty satisfaction.

Results from 2010 and 2011 senior surveys for these sub-areas are tabulated in Table A where ratings are on a Likert scale of 1-5 (with 5 being very satisfied). In comparison, satisfaction with all these sub-areas saw improvement in the spring 2011 survey over those in the spring 2010 survey. Of the survey questions considered in Table A the satisfaction with "career information from your Department" posted the most significant improvement as the rating advanced from 2.80 to 3.36. At the rating of 3.36 on a scale of 1 to 5, however, there is still plenty of room for improvement. The rating change could be a result of improving economy that generated more internship and career opportunities that were communicated to the ECC College and the Department and announced to students.

Table A: Averages of responses to questions related to faculty performance in 2010 and 2011 Graduating Senior Surveys. (Likert scale of 1-5 with 5 being very satisfied)

Questions in Senior Survey	2010 Rating	2011 Rating
Quality of teaching by faculty in your department. (Q15)	3.70	4.00
Access to faculty in your department. (Q17)	4.10	4.27
Academic advising from your major advisor. (Q24)	3.60	3.94
Career information from your department. (Q26)	2.80	3.36
I would recommend my major program at CSU, Chico to others. (Q44)	4.08	4.39

Without specific recommendations from the 2009-2010 Annual Program Improvement Report, the following actions taken in 2010-2011 might have, if any at all, contributed to the increased student satisfaction of identified weaknesses.

1. Rotated instructors so that the students did not have the same instructors for certain courses every semester.
2. Complied and distributed Student Evaluation of Teaching (SET) results to faculty. This might have provided motivation for better teaching.
3. Distributed received leads on internship and career opportunities to students in a timely fashion.

2.1.2 Curriculum

The 2009-2010 Annual Program Improvement Report recommends consideration of strengthening statistics and eliminating engineering economics in the Mechanical Engineering curriculum. Both statistics and engineering economics are major components of CIVL 302 – Engineering Economics and Statistics.

The component of statistics in CIVL 302 is a part that fulfills the math and sciences requirement for ABET accreditation. The desire for enhanced statistics coverage in CIVL 302 was conveyed to the Department of Civil Engineering. It is not clear if the statistics component in CIVL 302 has been changed in 2010-2011.

There was no action taken to eliminate engineering economics from CIVL 302 as it is not a course taught by the Mechanical Engineering faculty. The possibility of eliminating engineering economics or CIVL 302 entirely, from the Mechanical Engineering curriculum was briefly discussed by faculty, but quickly abandoned for the course has an added mission of fulfilling university General Education requirements. As CSU, Chico is revamping its General Education requirement, the Department faculty has opted to preserve existing engineering courses, including CIVL 302, that can be double-counted as General Education courses.

2.1.3 Assessment Process

It was recommended in the 2009-2010 Improvement Report that the assessment record for Program Outcomes d, f, h, i, and j in CIVL 495 should be updated and made consistent with student course grades. As the MEMM Department has not received program outcome assessment data for CIVL 495 from 2010-2011, it is not clear if the recommended changes have been implemented.

It was also recommended that the Graduating Senior Survey process should be modified so that the open-ended comments by Mechanical Engineering majors can be distinguished from those from Mechatronic Engineering majors. The recommendation was adopted in 2010-2011 and collected open-ended comments were separated based on academic majors.

2.2 CURRICULUM CHANGES AND UNIT REDUCTION

In response to the directives from CSU Chancellor's Office, Provost at CSU Chico, and ECC College Dean, the department faculty engaged in the discussion and finalized a modified curriculum in spring 2011. The modification was aiming at (a) reducing total units in the major for tuition savings and shortening the time toward graduation for students and (b) reducing average faculty workload with the goal of cost savings.

The restructuring was achieved by eliminating/adding courses and reducing units of some courses. Changes made to the Mechanical Engineering curriculum include:

1. Deletion of PHYS 204C, change = -4 units
2. Addition of MECH 208, change = +3 units
3. Unit reduction of MECH 140 from 3 to 2, change = -1 unit
4. Unit reduction of MECH 306 from 4 to 3, change = -1 unit
5. Unit reduction of MECH 338 from 4 to 3, change = -1 unit
6. Unit reduction of MECA 482 from 4 to 3, change = -1 unit

As a result, the total units required for the degree was reduced from 132 to 127 (with units in the major from 105 to 100) and the total faculty workload was reduced by over ten WTUs (Weighted Teaching Units) per year assuming the same number of sections for all courses.

These changes will be gradually implemented starting in Fall 2011, and fully implemented in 2012-2013. Students taking these required courses with reduced units while following 2011 or older editions of university catalogs, or Major Academic Plans, will be allowed to graduate with less than 132 units. The revised four-year curriculum will appear in the 2012-2013 university catalog. The new major Academic Plan (MAP) can be found in Appendix A.

3. ASSESSMENT DATA GATHERED IN 2010-2011

3.1 Embedded Assessment of Program Outcomes

Methods and results of Program Outcome assessment embedded in selected courses are summarized in Table B. As in the past, students not demonstrating basic competency in a measured outcome received an F or I (incomplete) for the course. For an incomplete to be changed to a grade other than an F, basic competency needed to be demonstrated in the specified Program Outcome. Note that in most courses some students received an F or I because basic competency was not demonstrated by the conclusion of the course. A complete list of identified program outcomes can be found in Appendix B. Sample Program Outcome assessment record sheets are reproduced in Appendix C. The Table B is not complete due to the lack of assessment data for CIVL 495.

Table B: Results of embedded assessment instruments and results for 2010-2011.

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 2010	Spring 2011
a	MECH 340	Individual exams (×2)	Average of C- or better	<i>not taught</i>	2/53
b ₁	MECH 440B	Individual written test plan	Pass/fail assessment	<i>not taught</i>	0/45
b ₂	MECA 380	Lab assignment	C- (1.7/4.0) or better	<i>not taught</i>	3/55
c ₁	MECH 340	Individual design project	Average of C or better	<i>not taught</i>	1/53
c ₂	MECH 338	Design problems (×2)	70% on one of the two	<i>not taught</i>	1/50
d	CIVL 495	N/A	N/A	No Data	No Data
	MECH 440A	Individual in group project	Faculty advisor & peer evaluation	0/45	<i>not taught</i>
e ₁	MECH 440A	Individual assignment	Pass/fail grading	0/45	<i>not taught</i>
e ₂	MECA 482	Quizzes (×3) on system design	Average of C- or better	2/47	<i>not taught</i>
f	CIVL 495	N/A	N/A	No Data	No Data
g ₁	MECH 440A	Individual final design review	Pass/fail assessment	0/45	<i>not taught</i>
g ₂	MECH 340	Individual design project	Average of C or better	<i>not taught</i>	1/53
g ₃	MECH 340	Individual design project	Average of C or better	<i>not taught</i>	1/53
h	CIVL 495	N/A	N/A	No Data	No Data
i	CIVL 495	N/A	N/A	No Data	No Data
j	CIVL 495	N/A	N/A	No Data	No Data
k	MECH 306	Test questions (×5)	66%, 66%, 75%, 50%, 60% to pass	1/48	<i>not taught</i>
	MECH 308	Homework problems (×3)	70% on each problem	<i>not taught</i>	2/52
	MECA 380	Individual graphical assignment	11/18 or better	<i>not taught</i>	2/55

3.2 Fundamentals of Engineering (FE) Exam

The performance in various subject areas of CSUC Mechanical Engineering majors in the Fundamentals of Engineering (FE) exams in 10/2009 and 4/2011 are summarized in Tables C and D and Figure 1 where the average performance of CSUC students is compared with national and Carnegie 3 Universities averages. (Carnegie 3 Universities are comprehensive institutions offering bachelors and masters but no doctoral degrees and hence are similar to CSUC)

In comparison, the average pass-rates at the 10/2010 and the 4/2011 FE exams for Chico's Mechanical Engineering majors are lower than national and Carnegie 3 averages as shown

in Table C. The comparison with other universities in California was not made as the National Council of Examiners for Engineering and Surveying no longer publishes the average statistics.

Table C: CSUC Fundamentals of Engineering exam pass-rates comparing to national and Carnegie 3 comparators averages.

Institution	10/2010 Exam	4/2011 Exam	Combined
CSU, Chico	70%	64%	68%
National	81%	81%	81%
Carnegie 3	73%	77%	76%

One possible factor contributing to CSUC's lower average pass-rate (68%) in could be the larger fraction of students taking the mechanical engineering specific afternoon exam. For some reasons, more CSUC students (28 out of 34, or 82%) chose the discipline-specific afternoon exam at the 10/2010 and the 4/2011 exams as summarized in Table D. Those taking the discipline-specific afternoon exam did not perform as well as those taking the general exam (64% pass-rate vs. 83%). It should be noted that CSUC students taking the general afternoon exam, as a group, had an average pass rate (83%) higher than national and Carnegie 3 comparators averages (78% and 77%, respectively).

Table D: Pass-rates in the mechanical engineering specific and general afternoon exams for mechanical engineering students who were enrolled at CSUC when taking the exam.

Institution	Percent Students Took ME PM Exam	Pass-rate
CSUC	82%	64%
National	77%	82%
Carnegie 3	68%	76%
	Percent Students Took General PM Exam	Pass-rate
CSUC	18%	83%
National	23%	78%
Carnegie	32%	77%

Performance in various subject areas in the morning exam is summarized in Figure 1. Here data from the 10/2010 and 4/2011 exam administrations, including those taking general and mechanical engineering specific afternoon exams, have been aggregated. It should be noted that CSUC students are required to take the FE exam while the national and Carnegie 3 comparators' exam takers are not.

As shown in Figure 1, Mechanical Engineering students from CSUC had average scores lower than national and Carnegie 3 Universities averages in all subjects, except Thermodynamics, in the morning exam session. In fact, the average score for Thermodynamics was slightly higher than national and Carnegie 3 comparators averages. Conversely, CSUC students scored significantly lower than national and Carnegie 3 comparators averages in Mathematics, Computers, Engineering Economics, Dynamics, and Electricity and Magnetism.

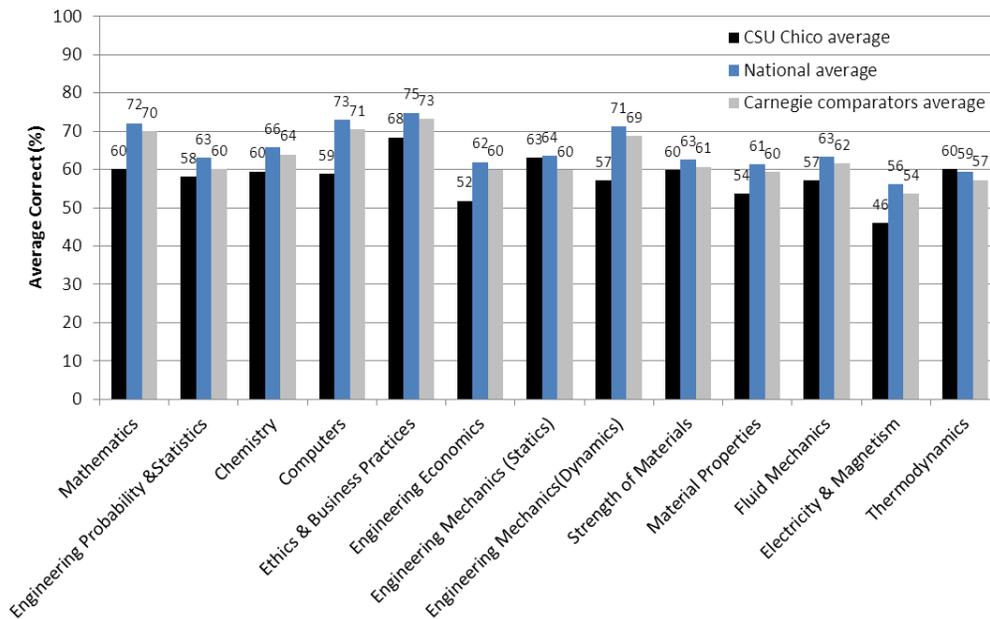


Figure 1- Fundamentals of Engineering 2010-2011 performance by subject area in the morning exam for ME majors who were enrolled at CSUC when taking the exam (n = 34).

Performance of CSUC mechanical engineering students in the general afternoon exam of the 10/2010 and 4/2011 FE exams is summarized in Figure 2.

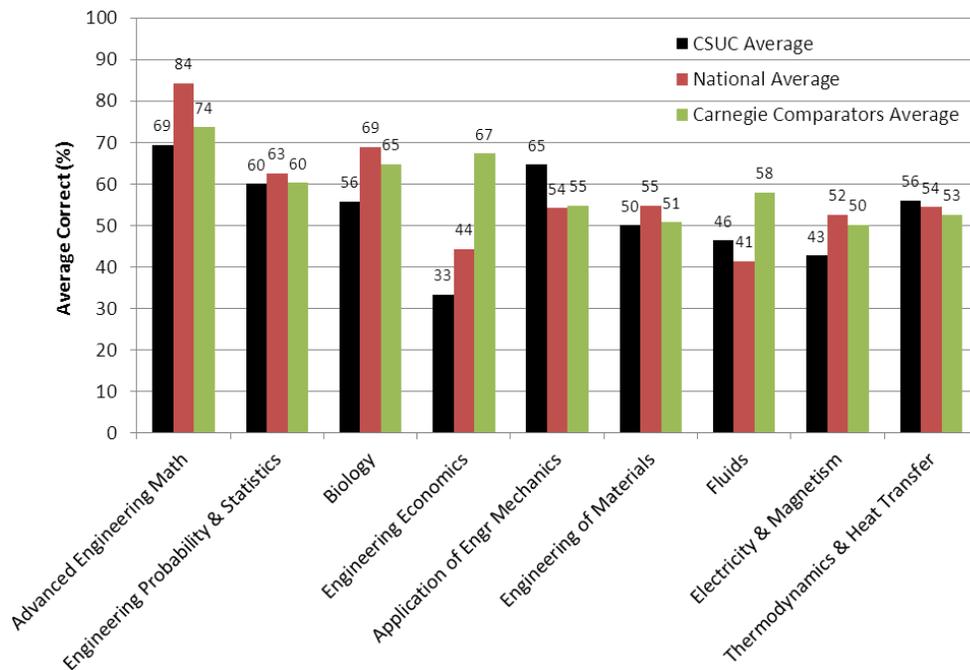


Figure 2 – 2010-2011 FE performance by subject area in the general afternoon exam for mechanical engineering majors who were enrolled at CSUC when taking the exam (n = 6).

As shown in Figure 2, CSUC Mechanical Engineering students scored higher than national and Carnegie 3 averages in Application of Engineering Mechanics and Thermodynamics & Heat Transfer, but significantly lower in Advanced Engineering Math and Engineering Economics in the general afternoon exam.

Based on Figures 1 and 2, mechanical engineering students at CSUC appear to be well prepared in Thermodynamics/Heat Transfer, but inadequately prepared in Engineering Mathematics and Engineering Economics.

The performance by subject area in the mechanical engineering specific afternoon exam of the 10/2010 and 4/2011 FE exams is shown in Figure 3.

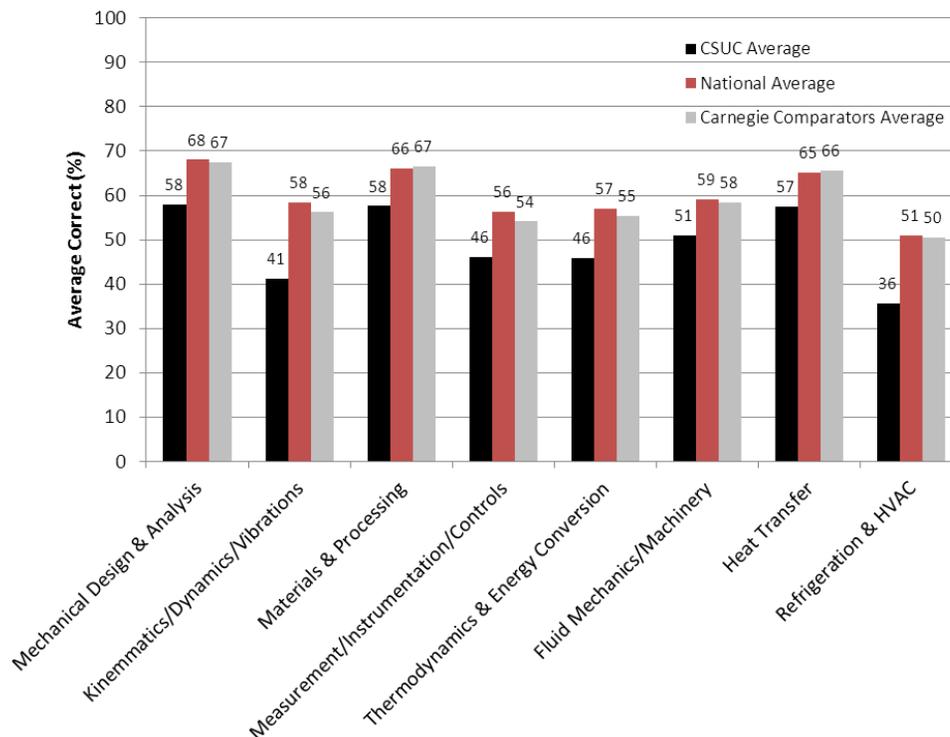


Figure 3 – Performance by subject area in the mechanical engineering specific afternoon exam of the 10/2010 and 4/2011 Fundamentals of Engineering exam for mechanical engineering students who were enrolled at CSUC when taking the exam (n = 28).

Figure 3 reveals two particularly low scores in Kinematics/Dynamics/Vibrations and Refrigeration & HVAC. The fact that Vibrations and HVAC are not taught as required courses in the CSUC’s Mechanical Engineering curriculum may very well contribute to the low scores. Consequently, it could be a factor for the low average pass-rate (64%) for those CSUC students who took the discipline-specific afternoon exam. Other CSUC students who took the general afternoon exam had a higher pass-rate of 83%.

3.3 Graduating Senior Survey

In spring 2011 an anonymous online survey of Mechanical Engineering majors enrolled in MECH 440B was conducted. The survey questions are reproduced in Appendix C. The responses of 34 of the 45 mechanical engineering majors are documented in the College of Engineering, Computer Science, and Construction Management assessment report – ECC Senior Exit Survey Results, AY 2010-2011. The survey questions can be grouped into those relating to (1) demographics and post-graduate plans (which will not be discussed further in this report), (2) educational satisfaction, (3) Program Outcomes, (4) project management skills, and (5) other outcomes.

3.3.1 Educational Satisfaction

Survey results on educational satisfaction from 2005 to 2011 and changes from 2010 to 2011 are summarized in Table E and Figure 4, respectively.

Table E: 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 . . .	2005	2006	2007	2008	2009	2010	2011
15	Quality of teaching by faculty in your department	3.86	4.17	3.83	3.60	3.75	3.70	4.00
16	Quality of teaching by other faculty	3.29	3.80	3.50	3.46	3.63	3.60	3.45
17	Access to faculty in your department	4.36	4.31	4.10	4.30	4.19	4.10	4.27
18	Availability of courses in your department	3.79	3.54	3.50	3.53	2.81	3.13	3.52
19	Quality of courses in your department	3.79	4.00	3.93	3.74	3.69	3.62	3.88
20	Access to lab facilities and equipment	3.64	3.97	3.33	3.62	3.75	3.38	3.97
21	Quality of laboratories and equipment	3.21	3.66	3.37	3.33	3.25	3.35	3.70
22	Access to computer facilities	4.21	4.03	4.20	4.15	4.13	3.87	4.15
23	Quality of computer facilities	4.31	3.89	3.67	3.68	3.41	3.30	3.27
24	Academic advising from your major advisor	3.29	3.57	3.53	3.55	3.84	3.60	3.94
25	Academic advising from the Advising Office	2.77	3.00	2.97	3.13	3.13	3.32	3.24
26	Career information from your department	3.38	3.11	3.23	3.43	2.77	2.80	3.36
27	Availability of GE courses	3.43	3.71	3.73	3.90	3.69	3.65	3.45
28	Quality of GE courses	3.14	3.46	3.17	3.23	3.13	3.20	2.85
29	Overall quality of your education	3.79	4.11	3.90	3.90	3.88	3.90	4.18
30	Your overall experience at Chico State	4.00	4.29	4.17	4.23	4.16	4.20	4.30
44	I would recommend my major at CSU, Chico to others	3.77	4.35	4.24	4.28	4.22	4.08	4.39

According to Figure 4, in the 2011 survey, questions directly related to the MEM department had encouraging improvement over those in the 2010 survey. The biggest changes are in “access to lab facilities & equipment (Q20)” and “career information from your department (Q26)”. Questions receiving lower ratings in 2011 than in 2010 are all in areas related to other programs or campus units, such as “quality of teaching by other faculty (Q16)”, “academic advising from the Advising Office (Q25)”, and “availability” and “quality of GE courses (Q27 and Q28)”.

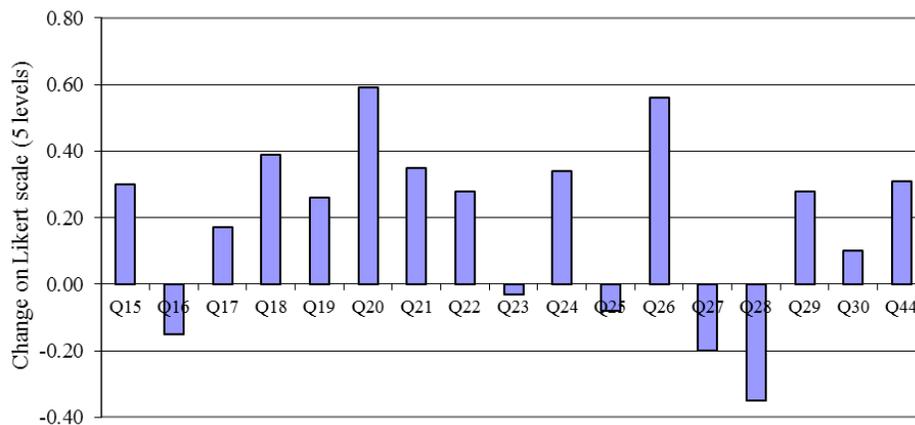


Figure 4: Changes of responses to survey questions regarding educational satisfaction from 2010 to 2011.

3.3.2 Program Outcomes

Response means for survey questions relating to Program Outcomes are tabulated in Table F, and the changes from 2010 to 2011 are summarized in Figure 5.

Table F: Means of responses to survey questions relating to Program 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 ...	2005	2006	2007	2008	2009	2010	2011
31	Apply knowledge of math, science, engineering, or technology to solve problems	4.07	4.26	4.30	4.23	4.13	4.15	4.36
32	Design and conduct experiments	3.86	4.17	4.20	4.00	3.69	3.80	4.15
33	Analyze and interpret data	4.14	4.09	4.30	4.10	4.03	3.93	4.21
34	Design a component or system to meet desired needs	3.93	4.34	4.37	4.15	4.31	4.25	4.36
35	Function on a multidisciplinary team	4.36	4.49	4.57	4.23	4.28	4.42	4.36
36	Identify, formulate, and solve technical problems	4.14	4.40	4.33	4.20	4.31	4.30	4.33
37	Communicate technical matters in writing	3.71	4.23	3.90	3.98	3.94	3.82	4.27
38	Communicate technical matters orally	4.00	3.94	4.07	4.13	3.94	3.95	4.27
39	Understand & apply professional & ethical principles	4.14	3.91	4.00	4.15	4.35	3.80	4.21
40	Understand contemporary issues facing society	3.57	3.51	3.60	3.95	3.84	3.70	3.82
41	Use modern tools and technology	3.57	3.94	4.00	3.85	4.03	3.85	4.06
42	Enter the workplace (I)	4.00	4.06	4.27	3.95	3.90	3.77	4.15
43	Continue learning	4.54	4.26	4.37	4.23	4.25	4.36	4.48
S1	Produce a set of dimensioned engineering drawings	3.48	3.86	4.10	3.80	<i>no data</i>		4.48
S2	Communicate manufacturing needs to a technician	3.41	3.83	4.07	3.83	<i>no data</i>		4.30
S4	Discuss tolerances on manufactured parts	3.10	3.26	3.79	3.60	<i>no data</i>		4.03
S7	Integrate a number of parts in to a subsystem	3.62	4.17	4.07	3.95	<i>no data</i>		4.36
S8	Prepare a design review	3.45	4.17	4.24	3.80	<i>no data</i>		4.21
S9	Plan a test and verification program	3.62	3.89	4.21	3.63	<i>no data</i>		4.21
S10	Order parts from a vendor	3.76	<i>no data</i>		3.98	<i>no data</i>		4.30

(I) Question number 42 is not a defined Program Outcome

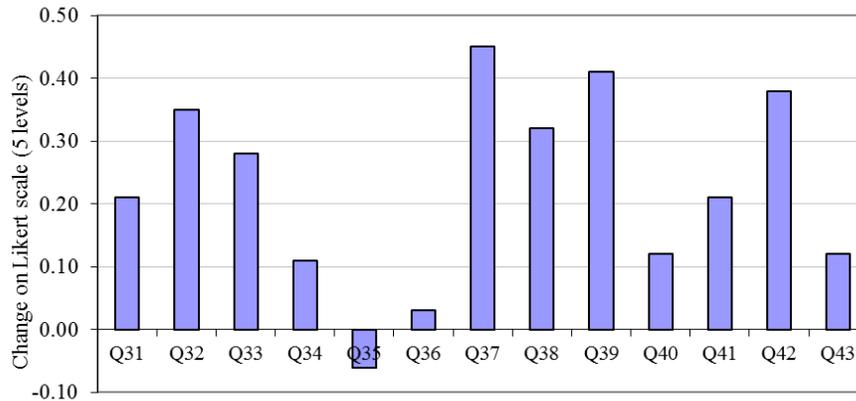


Figure 5: Changes of responses to survey questions relating to Program Outcomes from 2010 to 2011

It is quite clear that graduating Mechanical Engineering seniors are fairly satisfied with their learning in the major as they felt well prepared in all surveyed areas. In comparison, ratings for surveyed areas are mostly higher in 2011 survey than those in 2010, except the ability “to function on a multidisciplinary team (Q35)”. Students are still very satisfied with the ability to “function on a multidisciplinary team”, a rating of 4.36 on Likert scale of 1-5, although the rating dropped slightly from 2010 to 2011.

3.3.3 Project Management Skills

Responses to questions on management skills are tabulated in Table F.

Table F: 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 ...	2005	2006	2007	2008	2009	2010	2011
S3	Create a Gantt chart for a project	3.17	3.57	3.45	3.53	<i>no data</i>		3.91
S5	Identify the critical path for a project	3.03	<i>no data</i>		3.78	<i>no data</i>		4.09
S6	Develop a detailed project budget	3.48	3.60	4.00	3.70	<i>no data</i>		4.18

The ratings for all three questions on management skills in 2011 survey are higher than those from all previous years dated back to 2005. For lack of data from 2009 and 2010, the comparison is not possible.

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 MENG supplemental questions are categorized and summarized in the following. The comments presented here are direct quotes, including possible spelling and grammatical errors.

Courses

- “I would like more emphasis on tolerances and GD&T.”
- “It would be beneficial to put an assignment somewhere before senior project on the proper procedure for ordering parts from a vendor.”
- “The class sizes have also increased greatly since the budget cuts, and that has certainly had a negative impact on my learning.”
- “... the department should focus the program on preparing someone who initially doesn’t have any knowledge in the subjects, to be able to design and understand common products and devices by the time they graduate.”
- “I would have also liked to have had a required class in linear algebra in place of third semester calculus. ...felt like I needed it in many of my classes however, I have not ever used the third semester of calculus since I was in third semester calculus.”
- “I feel some of the information taught is outdated, ...”
- “For my internship in the HVAC design field I had to learn everything on the job, I feel my education should incorporate energy modeling and AutoCAD.”
- “I would have felt more prepared if Machine design was structured differently.”
- “Classes I feel could be cut: Physics 204C ...Math 220”
- “CIVL 302 (ENGR Econ; Stats) – probably shouldn’t be cut, but I know I didn’t take much of anything away from the class.”
- “Various GE classes (POLS155, HIST 130, etc.) – generally seem like a waste of time when compared to something like a composite class.”
- “..., it would be great to re-structure MECH 308 (finite element analysis). ... I think it should use excel for some basic truss problems, then go into how we can use programs like COSMOS more effectively.”
- “Circuits 1 could have been a lot better. Maybe tailor a section just for ME and MECA.”

Faculty

- “Quality of teachers seemed very inconsistent.” (×2)
- “What classes teachers teach should (be) evaluated every year, some teachers may seem qualified to teach a class but in the end fail to deliver the needed knowledge - - - ”
- “- - - the teacher evaluations are ridiculous. They need to be more in depth. Add a question ... what could the teacher do better in the future ... what has the teacher done to make this a good learning experience ...How has this class been insufficient?”

Capstone Project

- “If and when a project is presented I think funding needs to be verified and ensured ...”
- “MECH 440A/B is an excellent course. It provides students a chance to integrate everything that we have learned.”
- “Make sure customer ... know that if they change their mind on what they want for a design each week ... it makes it harder for the group to actually get any productive work done, and don't give me that that is normal in the industry.”
- “... not to let some teachers have their little pet projects be one of the groups choices, when your advisor is your client and your sources of funding it gives them too much power and they start to lose the ability to give constructive criticism or be objective about what they are telling the students.”
- “My senior project has been rewarding and challenging as well.”

Tests

- “Make testing more stringent. It is very easy to pass tests with little knowledge when it is open book and notes too.”
- “It makes no sense that that no one fails certain classes.”
- “The measurement of academic performance could use some improvement, especially in terms of partial credits. ... some instructors would only evaluate two or three problems out of a large problem set, ... Some instructors also tend to give very little partial credit on tests and exams, ...”
- “Cheating is somewhat of an issue in the department. This stems from professors who recycle tests in particular.”

Lab Experience

- “There should be more focus on real world problems and hands on laboratory learning.”
- “Removing activities and labs from classes is a awful idea ...”

Support

- “Overall support of student learning is great in the College of Engineering, and I feel very prepared graduating with this college degree.”
- “Computer labs need to be updated and maintained more effectively (specifically OCNL 438, 436, 434 and 431).”
- “Some guidance and encouragement to do well in lower division math/science/ engineering courses would have been invaluable.”

3.4 Student Evaluation of Teaching (SET)

Mechanical engineering students take courses taught by the MEMM department as well as those by other academic departments. Here the spring semester SET data from 2010 and 2011 for MECH and MECA courses are summarized in Figure 6. The 10-question set used for quantitative SET ratings can be found in Appendix E.

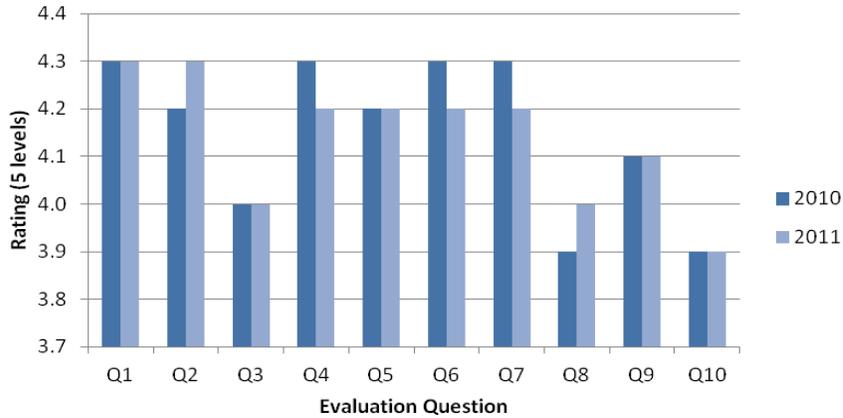


Figure 6 – SET results for MECH and MECA courses from spring 2010 and spring 2011. The rating scale is 1 to 5 with 5 being the most favorable.

The ratings for MECH and MECA courses taught in spring semesters are reasonably consistent from 2010 to 2011 as evaluated in SET by students in those courses. Notably, the question about “increased knowledge of the subject matter (Q2)” receives reasonably high rating hinting a good perceived learning.

The instructional effectiveness of MECH and MECA instructors varies greatly from 4.8 to 2.9 as reflected in the ratings for the question “The instructor presents the material in an understandable way.” Figure 7 illustrates the wide spread of ratings for lecturing skill from the spring 2011 SET.

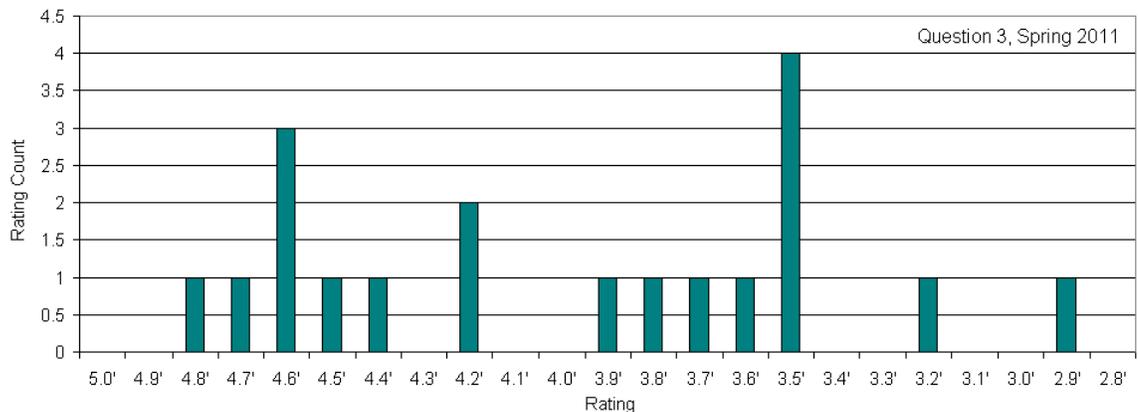


Figure 7 – Summary of ratings for instructional effectiveness (Question 3) in the SET conducted in spring 2011. Ratings are on a scale of 1 to 5 with 5 being most favorable.

4. RECOMMENDATIONS

4.1 Faculty

4.1.1 Instruction Effectiveness

It was commented by students in the Spring 2011 Graduating Senior Survey that the instruction and grading of faculty vary significantly. The SET report on the lecturing skill of MECH and MECA instructors also supports a similar observation. It is important that some faculty members should be more conscientious about instruction-related practices.

4.1.2 Tests

Several comments in the Spring 2011 Graduating Senior Survey were made on the consistency of grading and the fairness of tests. As it is neither possible nor realistic to try to regulate grading policies and test methods, some faculty would need to exercise better judgment in designing tests and grading.

4.2 Fundamentals of Engineering (FE) Exam Requirement

A total of 34 FE exam takers in October 2010 and April 2011 identified themselves as being enrolled at CSU, Chico at the time. Annually, on average, the Mechanical Engineering program had more than 34 graduates in recent years. One of the reasons for less-than-perfect participation rate could be the number of foreign students who requested and were granted a waiver for the FE exam for lacking Social Security number to register for the exam.

One of the original purposes of requiring Mechanical Engineering majors to take the Fundamentals of Engineering (FE) exam before graduation is to use the exam for program outcome assessment purposes. Without all graduates taking the exam, the findings derived from the FE exam reports are not as representative.

It is possible for foreign students to obtain a Social Security number, if they apply for it early, for the FE exam registration. Although the number of graduating foreign students varies from year to year, the faculty should consider whether to require them to take the FE exam.

4.3 Curriculum

4.3.1 Dynamics (MECH 320)

Although it is not department's intention to teach to the FE exam, it does serve to identify strength and weakness in areas of students' learning.

The morning session of the FE exams in 10/2010 and 4/2011 does identify Dynamics as one of the serious weaknesses. The department faculty should review the course content, textbook selection, and classroom instruction of MECH 320 and find a way to improve student learning in the required subject. It is also suggested that the review session on the subject should be better conducted before each FE exam.

4.3.2 Finite Element Analysis (MECH 308)

The primary tool used in MECH 308 has been Excel in recent years. It was suggested in the Graduating Senior Survey that the MECH 308 should be restructured to include more use of professional FEA tools such as COSMOS. It was also observed by some faculty that students do not use FEA with confidence for analysis in senior design projects. As FEA is becoming one of the standard tools in engineering design, the MECH 308 class probably should provide more instruction and exercise on effective use of commercial FEA software.

4.3.3 Capstone Projects

It is obvious that graduating seniors appreciate the challenge, interaction with industry, and practical learning experience of the senior design projects. Nevertheless, there are also suggestions in the Graduating Senior Survey for secure funding and reasonable and consistent demands from sponsors. Perhaps the Department should reconsider enforcing upfront collection of funds and screening sponsors more carefully.

4.3.4 Engineering Economics (CIVL 302)

The component of engineering economics in CIVL 302 continues to be a weakness in students' learning. The topic not only gathers student complaints but also appears to be a significant deficiency as revealed in FE exams. The department chair would need to continue to communicate the concerns to the Department of Civil Engineering.

4.4 Graduating Senior Survey Process

Through class announcements and email reminders the attempt of ensuring all students in MECH 440B participate in the Graduating Senior Survey was not very successful as only 76% of students completed the survey in Spring 2011.

The switch from in-class (MECH 440B) to online ECC graduating senior survey in 2011 probably had an effect on the participation rate. The instructor of MECH 440B did not have direct online monitoring and timely feedback on student participation before the end of semester. It is recommended that the survey be conducted earlier in the semester and for a longer time period so that the instructor has opportunities to possibly enforce the participation. Perhaps the graduating senior survey can also be made a course requirement for MECH 440B.

4.5 CIVL 495 for Program Outcome Assessment

It has been believed that CIVL 495 is a suitable course where Program Outcomes d, f, h, i, and j can be properly measured. Lately, the reliability and accuracy of the assessment data, however, are discounted by (a) the inconsistency between the competency assessment results and the student course grades as pointed out in the 2009-2010 Annual Improvement Report and (b) the availability of assessment data to the MMEM department. In the 2010-2011 cycle, the Program Outcome Assessment data were not made available to the Department in spite of repeated requests. The faculty may consider the possibility of selecting some MECH and MECA courses for the same competency assessments.

Appendix A

Modified Mechanical Engineering Major Academic Plan

California State University, Chico
MAJOR ACADEMIC PLAN (MAP)
(Consult 2012-13 University Catalog for Official Degree Program)

First Semester		Second Semester		Comments
CHEM 111 (GE Area B1)	4	MATH 121 [*1]	4	NOTE: This is a high unit major with modifications to GE which are included in this plan.
MATH 120 (GE Area A4)[*1]	4	MECH 100	1	
MECH 140	2	MECH 100L	1	
ENGL 130 (GE Area A2)[*1]	3	SMFG 160	3	NOTE: Department advising is mandatory for all majors in this degree program. [*1] C- or better is required for this course.
GE Area A1 [*1]	3	PHYS 204A [*1]	4	
		GE Area B2	3	
TOTAL	16	TOTAL	16	
Third Semester		Fourth Semester		Comments
CIVL 211 [*1]	3	EECE 211	3	[*2] The Cultural Divisity (US Diversity and Global Culture) MUST be met with GE.
MATH 220	4	EECE 211L	1	
MECH 210	3	MATH 260	4	
PHYS 204B	4	MECH 200	2	
GE Area C [*2]	3	MECH 208 (SP)	3	
		GE Area D [*2]	3	
TOTAL	17	TOTAL	16	
Fifth Semester		Sixth Semester		Comments
CIVL 311 [*1]	4	CIVL 302	3	Apply to graduate by May 15.
CIVL 321	4	MECA 380 (SP)	3	
MECH 306 (FA)	3	MECH 308 (SP)	3	
MECH 320	3	MECH 338 (SP)	3	
MECH 332	3	MECH 340 (SP)	3	
TOTAL	17	TOTAL	15	
Seventh Semester		Eighth Semester		Comments
MECH 432 (FA)	4	CIVL 495	3	[*3] C- or better is required for the WP course.
MECH 440A - WP (FA) [*3]	3	MECH 440B (SP)	2	
MECA 482 (FA)	3	Technical Elective [*5]	3	[*4] 2 UD Theme courses are required. Please consult a department advisor.
GE UD Theme [*2] [*4]	3	GE UD Theme [*2][*4]	3	
HIST 130	3	POLS 155	3	[*5] An upper-division course with CIVL, CSCI, MECA, MECH, or SMFG prefix.
TOTAL	16	TOTAL	14	127 units required for degree.

Units available for electives, minor, or certificate: 0

Approved 5/5/2011

Appendix B

Statement of Mechanical Engineering Program Outcomes*

Mechanical Engineering Program graduates must have:

- a. An ability to apply knowledge of mathematics, science, and engineering*
- b₁. An ability to design experiments to evaluate the performance of a mechanical/thermal system or component with respect to specifications*
- b₂. An ability to conduct experiments, as well as analyze and interpret data*
- c₁. An ability to design a mechanical system, component, or process to meet desired needs*
- c₂. 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*
- e₁. An ability to define engineering problems*
- e₂. An ability to solve engineering problems*
- f. An understanding of professional ethical responsibility*
- g₁. An ability to communicate technical matters effectively in oral form*
- g₂. An ability to communicate technical matters effectively in written form*
- g₃. An ability to communicate technical matters effectively in graphical form*
- h. The broad education necessary to understand 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 C

Sample Program Outcome Assessment Record Sheet

Mechanical Engineering Program Outcome Record-Sheet

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

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

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

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

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

Suggestions for improving the program:

Note: Shaded fields are to be fill-in.

Appendix D

ECC Graduating Senior Survey Instrument

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

For Technical Questions,
contact Paul Weatherby: 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](#)

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For Technical Questions, contact Paul Weatherby: 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

For Technical Questions,
contact Paul Weatherby: pweatherby@csuchico.edu

MENG Supplemental Questions

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

	Very Unprepared				Very Prepared
1. Produce a set of dimensioned engineering drawings	<input type="radio"/>				
2. Communicate manufacturing needs to a technician	<input type="radio"/>				
3. Create a Gantt chart for a project	<input type="radio"/>				
4. Discuss tolerances on manufactured parts	<input type="radio"/>				
5. Identify the critical path for a project	<input type="radio"/>				
6. Develop a detailed project budget	<input type="radio"/>				
7. Integrate a number of parts into a subsystem	<input type="radio"/>				
8. Prepare a design review	<input type="radio"/>				
9. Plan a test and verification program	<input type="radio"/>				
10. Order parts from a vendor	<input type="radio"/>				

11. 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.

For Survey Content Questions,
contact Lynn Abbiati: labbati@csuchico.edu

For Technical Questions,
contact Paul Weatherby: pweatherby@csuchico.edu

Appendix E

Student Evaluation of Teaching (SET) Questions

Student Evaluation of Teaching – Part I

California State University, Chico

PART B

RESPONSE CODE (POINT VALUE)*

<u>SA</u> (5) Strongly Agree	<u>A</u> (4) Agree	<u>N</u> (3) Neither agree nor disagree	<u>D</u> (2) Disagree	<u>SD</u> (1) Strongly Disagree	<u>NA</u> (0) Does Not Apply
------------------------------------	-----------------------	---	--------------------------	---------------------------------------	------------------------------------

1. The syllabus explains course requirements.
2. My overall knowledge of the subject matter has increased due to the instruction of this course.
3. The instructor presents the material in an understandable way.
4. The instructor is well prepared for class.
5. The instructor follows the course syllabus.
6. The instructor is available during office hours.
7. The course assignments contribute to learning.
8. The instructor gives appropriate feedback.
9. The instructor communicates high expectations for student achievement.
10. The instructor monitors student learning throughout the course.

*Number used to compute mean and standard deviation.