FRESNO STATE
Lyles College of Engineering

ANNUAL REPORT ON ASSESSMENT OF
B.S. IN MECHANICAL ENGINEERING (ME) PROGRAM
ACADEMIC YEAR 2016-2017

PREPARED BY

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Bachelor of Science Mechanical Engineering

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1. **What learning outcome(s) did you assess this year?** List all program outcomes you assessed (if you assessed an outcome not listed on your department SOAP please indicate explain). Do not describe the measures or benchmarks in this section Also please only describe major assessment activities in this report. No GE assessment was required for the 2016-2017 academic year.

Per the published SOAP for the BSME Program as well as its response to Engineering Accreditation Commission (EAC) Criterion 4 of the BSME Program's ABET self study, the Department assesses every SLO every year. The SLOs are listed as SOs a) through k) as follows.

Upon the successful completion of the Bachelor of Science in Mechanical Engineering program at California State University, Fresno, students will have achieved the following:

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

2. **What assignment or survey did you use to assess the outcomes and what method (criteria or rubric) did you use to evaluate the assignment?** If the assignment (activity, survey, etc.) does not correspond to the activities indicated in the timeline on the SOAP, please indicate why. Please clearly indicate how the assignment/survey is able to measure a specific outcome. If after evaluating the assessment you concluded that the measure was not clearly aligned or did not adequately measure the outcome please discuss this in your report. Please include the benchmark or standard for student performance in your assessment report (if it is stated in your SOAP then this information can just be copied into the report). An example of an expectation or standard would be "On outcome 2.3 we expected at least 80% of students to achieve a score of 3 or above on the rubric."

2.1 Direct Measures:

2.1.1 *Fundamentals of Engineering (FE) Examination*: Alumni and students (usually seniors in their last semester) of the BSME program routinely take the FE examination as the first step in obtaining licensure as a Professional Engineer (PE). This FE exam is nationally-normed and is an excellent external measure of how well the BSME program prepares its graduates for industry and/or additional study. The FE examination is administered during specific periods in spring and fall of each year. Because the results from the FE exam are broken down by topic, these topics can be related to SLOs for direct measures of outcome attainment. The target for achieving an SLO is to meet or exceed the national percent correct for each section of the FE exam that applies to a particular SLO.

2.1.2 *Student Performance in Courses:* At the beginning of each semester, faculty are notified which courses for that semester will be required to have course worksheets completed, including student performance measures. Each faculty member teaching one of the targeted courses determines the student performance measure for the particular CLOs and the related SLOs for that course. Examples of performance measures include individual exam questions/problems, design projects, in-class activities, etc. At the end of each semester the individual faculty member completes the appropriate course worksheet for the appropriate course and reports the level of attainment of each SLO (mean, standard deviation and sample size) as appropriate. The completed course worksheet is forwarded to the ME department assessment coordinator for inclusion in the semester and annual assessment reports for subsequent evaluation by the all ME faculty at targeted faculty meetings and the annual department retreat. The target for achieving an SLO is 70% for the mean student performance of each course and for the pooled means.

2.1.3 *Capstone Design Culminating Experience:* The capstone design culminating experience is not only a requirement for ABET EAC accreditation but also demonstrates the level of synthesis of all preceding coursework in the curriculum. A two-course sequence for the capstone design culminating experience (i.e., ME135 in fall semester senior year and ME155 in spring semester senior year) often involves a sponsored, "real-world" problem in which teams of students work collaboratively to identify, articulate, design, analyze, prototype, test, refine and demonstrate a working version of their engineering solution to the client/sponsor. Since ME135 and ME155 reflect mastery (M) of the SLOs in the BSME program, the level of student success in obtaining and documenting a solution to an engineering problem is a strong indication of the success of the program. The target is a minimum of student performance of 70% for the each SLO as well as 70% student performance of the pooled means for all SLOs for ME135 and ME155.

2.2 Indirect Measures:

2.2.1 *Junior Survey:* Junior Surveys are administered in the fall and spring semesters of each academic year. Each semester, a junior-level course is chosen in which to administer the survey so as to assess student attitudes and perceptions in the first year of the upper division part of the program. Up until AY2015-16, the survey had been on paper but since then the survey has been web-based. The survey consists of two questions, each with 11 parts. The first question is: "How important is each of the following Program Student Outcomes (SOs) to the Bachelor of Science in Mechanical Engineering (BSME)? This is followed by a list of SLOs each with a multiple choice answer ranging from 0 (not applicable) to 5 (very strong). The second question is: "How satisfied are you with your education in the Mechanical Engineering Program at CSU, Fresno in regard to each of the following Program Student Outcomes (SOs)? This is followed by a list SLOs each with a multiple choice answer ranging from 0 (not applicable) to 5 (very strong). The results of this survey are important to understanding how well students understand the "tool box" of skills that the program has promised them (SLOs) as well as their perception of how well the program is delivering on that promise (albeit, as juniors, a work in progress). The target for any particular SLO is at least parity of student's expectation and satisfaction with the programs delivery of that SLO.

2.2.2 *Senior Survey:* Senior Surveys are administered in the fall and spring semesters of each academic year. Each semester, a senior-level course is chosen in which to administer the survey so as to assess study attitudes and perceptions at the in the final year of the upper division part of the program. Up until AY2015-16, the survey had been on paper but currently the survey is web-based. The survey consists of two questions, each with 11 parts. The first question is: "How important is each of the following Program Student Outcomes (SOs) to the Bachelor of Science in Mechanical Engineering (BSME)? This is followed by a list of SLOs each with a multiple choice answer ranging from 0 (not applicable) to 5 (very strong). The second question is: "How satisfied are you with your education in the Mechanical Engineering Program at CSU, Fresno in regard to each of the following Program Student Outcomes (SOs)? This is followed by a list SLOs each with a multiple choice answer ranging from 0 (not applicable) to 5 (very strong). The results of this survey are important to understanding how well students understand the "tool box" of skills that the program has promised them (SLOs) as well as their perception of how well the program is delivering on that promise (now as seniors nearing the end of the degree program). The target for any particular SLO is the at least parity of student's expectation and satisfaction with the programs delivery of that SLO.

2.2.3 *Course Surveys:* Course Surveys are administered in the fall and spring semesters of each academic year for every course offered in the Mechanical Engineering that semester. Up until AY2015-16, the survey had been on paper but since then the survey has been web-based. The survey consists of one request for input, with 11 parts: "Please assess the contributions of this course to the Mechanical Engineering Program Student Outcomes (SOs) a) through k)." This is followed by a list of SLOs each with a multiple choice answer ranging from 1 (marginally) to 5 (very strong) as well as 0 (not applicable) if the course does not contribute to that SLO. The results of this survey are important to understanding how well students understand the "tool box" of skills that the program has promised them (SLOs) as well as their perception of how well each course is delivering on that promise. The target for the particular SLOs attributed to the course is a student rating of 3 to 4.

2.2.4 Senior Exit Interview*:* The exit interview is an annual meeting of the graduating ME seniors with an alumnus of the ME program (typically a member of the industrial advisory board, IAB) where comments are solicited from students on their educational experiences in the department, college and university. Comments by graduating students are important to faculty and provide valuable input on how well the SLOs are being attained. They also point out strengths as well as shortcomings in the program that are addressed as part of the CQI process. The target is a subjectively-positive level of satisfaction with the program.

2.2.5 *Co-op Internship Survey:* A formal internship/cooperative education program (Valley Industry Partnership (VIP) for cooperative education) was initiated beginning in Spring 2007. As the program has matured, it has been the intent of the department and the college to provide this opportunity to as many students as possible. Students complete an appraisal of their experience in the middle of their internship and following completion of an internship program with a company. The target is a subjectively-positive experience of student participants.

3. What did you discover from the data? Discuss the student performance in relation to your standards or expectations. Be sure to clearly indicate how many students did (or did not) meet the standard for each outcome measured. Where possible, indicate the relative strengths and weaknesses in student performance on the outcome(s).

3. 1 Direct Measures:

3.1.1 *Fundamentals of Engineering (FE) Examination*: The results for the FE exam are reported for the institution and the nation each year for the spring and fall offering periods of the exam. The results are reported by topic and mapped to the specific SLOs for the program as shown in Table 3-1. Also shown in Table 3-1 are the results for the most recent FE exam results. The expectation is the CSU Fresno ME majors (typically seniors and recent alumni) will meet or exceed the national performance.

For illustrative purposes, historical results are shown for Mathematics (SLO a) in Figure 3-1. Similar bar charts have been compiled for other topics shown in Table 3-1. Generally, students and alumni meet or exceed the national performance in most categories.

Table 3-1 FE topics mapped to appropriate SLOs along with results for Fall 2015 and Spring 2016

FE topics	SLO for BSME at CSU, Fresno	Related Courses in BSME curriculum	% correct for CSU, Fresno ME Majors (57% passing) (Fall 2016)	% correct for all ABET-accredited ME Majors Nationally (78% passing) (Fall 2016)	% correct for CSU, Fresno ME Majors (64% passing) (Spring 2017)	% correct for all ABET-accredited ME Majors Nationally (74% passing) (Spring 2017)
Mathematics	**a**	MATH 75, 76, 77, 81	69% n=7	68% n=2910	67% n=11	68% n=4070
Probability and Statistics	**b, k**	ME125, ME 159	47% n=7	66% n=2910	58% n=11	64% n=4070
Computational Tools	**a, k**	ECE71, ME02	86% n=7	72% n=2910	77% n=11	71% n=4070
Ethics and Professional Practice	**f**	ME01, ME 135	92% n=7	77% n=2910	87% n=11	77% n=4070
Engineering Economics	**c**	ME 135, ME155	59% n=7	66% n=2910	67% n=11	67% n=4070
Electricity and Magnetism	**a, e**	PHYS 4B, ECE 91, 91L	75% n=7	69% n=2910	68% n=11	69% n=4070
Statics	**a, e**	CE20	66% n=7	65% n=2910	63% n=11	65% n=4070
Dynamics Kinematics and Vibrations	**a, e**	ME112, ME122, ME 134, ME142	57% n=7	64% n=2910	63% n=11	63% n=4070
Mechanics of Materials	**a, e**	CE121	60% n=7	63% n=2910	63% n=11	62% n=4070
Material Properties and Processing	**a, e, k**	ME31, ME32, ME95	57% n=7	65% n=2910	66% n=11	64% n=4070
Fluid Mechanics	**a, b, e, k**	ME116, ME118	68% n=7	65% n=2910	64% n=11	64% n=4070
Thermodynamics	**a, c, e, k**	ME136, ME156	64% n=7	62% n=2910	61% n=11	63% n=4070
Heat Transfer	**a, e, e, k**	ME145	58% n=7	63% n=2910	61% n=11	65% n=4070
Measurements Instrumentation and Controls	**b c, e, ,**	ME32, ME115, ME118, ME159	57% n=7	62% n=2910	53% n=11	62% n=4070
Mechanical Design and Analysis	**c, k**	ME154, ME135, ME155, ME164	59% n=7	61% n=2910	63% n=11	61% n=4070

Note: Only graduating seniors take FE exam, approximately 50 BSME CSU, Fresno seniors in 2017-17

3.1.2 *Student Performance in Courses:* A summary of the SLOs [(SO a) to SO k)] is show in the Figure 3-2. For the pooled means and standard deviations, the target of 70% is exceeded for all SLOs. An example of how well the courses met SLO a) is shown in Figure 3-3. Similar bar charts have been compiled for other SLOs. Measures of student performance show that the program overall is satisfying its target for all SLOs.

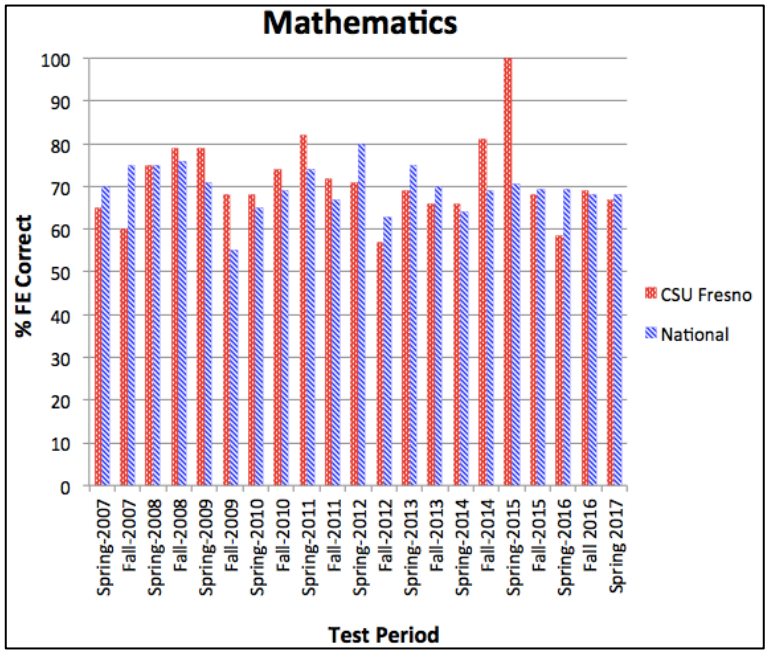

Figure 3-1 Example of historical FE results for Mathematics
(CSU Fresno ME major results and National results)

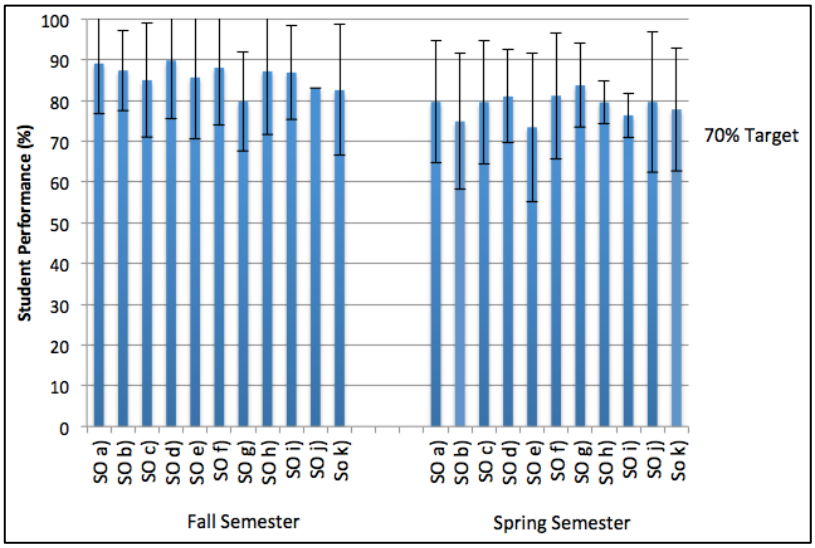

Figure 3-2 Summary of pooled SLO results for Fall and Spring semesters using student performance in courses

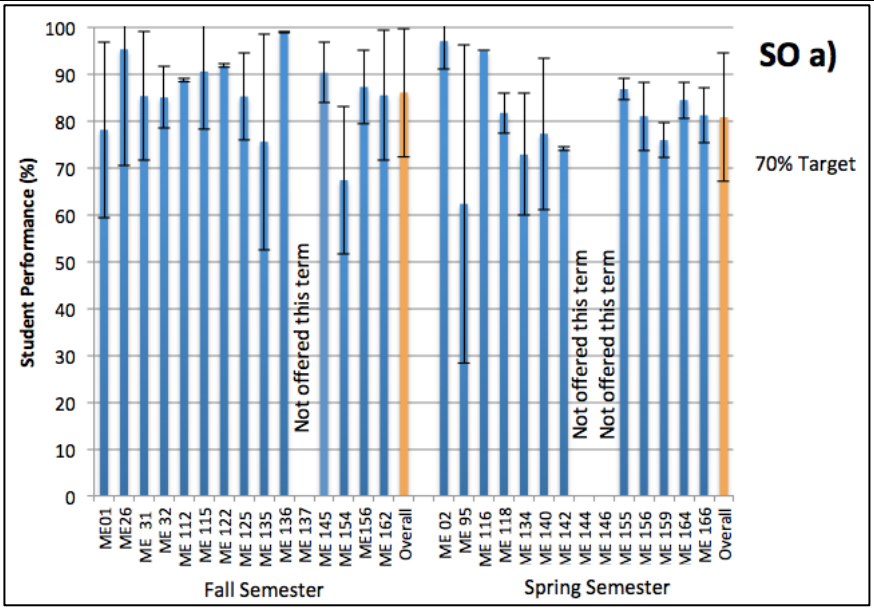

Figure 3-3 Summary of results for SLO a) for each course in Fall and Spring semesters

3.1.3 *Capstone Design Culminating Experience:* ME135 Introduction of Design: Senior Capstone Design I and ME155 Senior Capstone Design II are a two-semester Fall/Spring senior capstone design culminating experience. As such, these courses reflect mastery (M) level emphasis of all SLOs. A target of 70% attainment for each SLO as well as pooled SLOs in ME135 and ME155 points to mastery. Figure 3-4 shows results for fall and spring semesters.

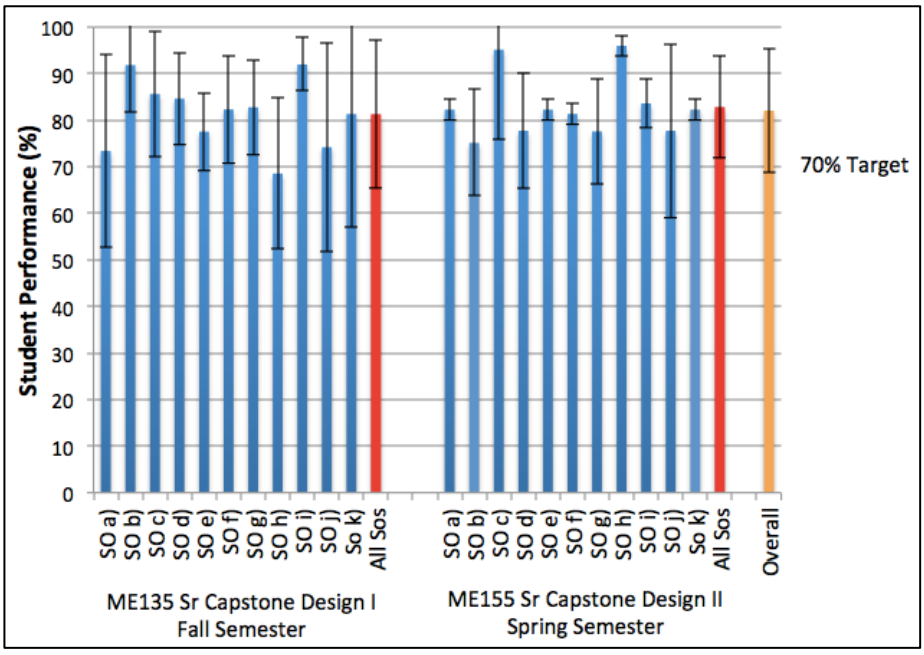

Figure 3-4 Results of SLO assessment for Senior Capstone Design Culminating Experience

3.2 Indirect Measures:

3.2.1 *Junior Survey:* Results of the Junior Survey are tabulated in Table 3-2. The results of the Junior Surveys are viewed as a reference baseline although they do indicate student satisfaction in almost all student outcomes. Improvement in these outcomes is expected as students take more upper division courses. The evaluation of Senior Survey and Senior Exit Interview results indicate changes in the performance of the students. Results of the Junior Survey are shared with the faculty and measures to improve the performance have been discussed on a regular basis since 2007. Faculty have noted that for some SLOs, juniors are less satisfied with their education to date than their rating of the importance of that SLO to their degree. It is felt that some of this dissatisfaction is related to the increasing number of lecturers used in recent years because of the steady increase of ME majors and the need to offer more sections of courses than tenured and tenure track faculty can staff without resorting to part-time lecturers. Although new full-time faculty have been added, the number of ME majors has continued to increase despite higher admission indices due to university impaction.

Table 3-2 Junior Survey (4-5 = High, 3-4 = Medium, 2-3 = Low, 1-2 = Weak)

Student Learning Outcome	How important is each SLO to BSME degree?		How satisfied with education at CSU, Fresno for each SLO?	
	Fall	**Spring**	**Fall**	**Spring**
a. An ability to apply knowledge of mathematics, science, and engineering	4.18 ±0.76, n=33	4.42 ±0.49, n=19	4.24 ±0.85, n=33	4.16 ±1.14, n=19
b . An ability to design and conduct experiments, as well as to analyze and interpret data	3.87 ±1.01, n=33	3.74 ±1.52, n=19	3.88 ±1.05, n=33	3.21 ±1.67, n=19
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	3.61 ±1.30, n=33	3.37 ±1.72, n=19	3.55 ±1.28, n=33	3.06 ±1.55, n=19
d. An ability to function on multidisciplinary teams	3.63 ±1.10, n=33	3.53 ±1.73, n=19	3.63 ±1.10, n=33	2.78 ±1.84, n=19
e. an ability to identify, formulate, and solve engineering problems	4.18 ±0.87, n=33	4.37 ±0.74, n=19	3.91 ±0.96, n=33	4.11 ±1.20, n=19
f. An understanding of professional and ethical responsibility	3.63 ±1.20, n=33	3.37 ±1.87, n=19	3.64 ±1.23, n=33	3.0 ±1.89, n=19
g. An ability to communicate effectively	3.61 ±1.30, n=33	3.42 ±1.87, n=19	3.64 ±1.34, n=33	3.39 ±1.77, n=19
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	3.52 ±1.35, n=33	3.63 ±1.75, n=19	3.82 ±1.19, n=33	3.67 ±1.76, n=19
i. A recognition of the need for, and an ability to engage in life-long learning	4.88 ±0.96, n=33	4.37 ±0.81, n=19	3.91 ±1.08, n=33	3.88 ±1.23, n=19
j. A knowledge of contemporary issues	3.45 ±1.16, n=33	3.05 ±1.93, n=19	3.48 ±1.18, n=33	3.17 ±1.67, n=19
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	4.06 ±0.98, n=33	3.89 ±1.52, n=19	4.06 ±1.07, n=33	3.61 ±1.67, n=19

Note: Numbers shown are: Mean ± Standard Deviation, n=sample size

3.2.2 *Senior Survey:* Results of Senior Surveys of the graduating class are tabulated in Table 3-3. Senior Survey results show similar levels of satisfaction in receiving instruction related to all SLOs. This is expected of the senior group, since senior level courses emphasize group projects involving design and development of systems, experimentation, communication in both oral and written forms, and real life constraints, in almost all courses. These trends indicate that there is an acceptable development in the preparation of CSU Fresno ME majors to become successful engineers.

3.2.3 *Course Survey:* Student SLO surveys have been administered in all ME courses each semester since Fall 2006. These surveys were instituted in order to guide the faculty in defining which SLOs a course should satisfy and obtain feedback from the students on how well they feel that these SLOs have been achieved. Course surveys of students as to how well each outcome is attained in each course (scale of 0 to 5) are also used to provide an indirect assessment of how well each SLO is being satisfied. Using Course Surveys, the target for attainment of a SLO in a particular course is a mean of 3 to 4. An example of course survey results for SLO a) is shown in Figure 3-5. Similar bar charts have been compiled for other SLOs.

Table 3-3 Senior Surveys (4-5 = High, 3-4 = Medium, 2-3 = Low, 1-2 = Weak)

Student Learning Outcome	How important is each SLO to BSME degree?		How satisfied with education at CSU, Fresno for each SLO?	
	Fall	**Spring**	**Fall**	**Spring**
a. An ability to apply knowledge of mathematics, science, and engineering	4.64 ±0.48, n=25	4.54 ±0.50, n=24	4.48 ±0.70, n=25	4.36 ±0.48, n-24
b . An ability to design and conduct experiments, as well as to analyze and interpret data	4.28 ±0.60, n=24	3.63 ±1.16, n=24	3.96 ±0.87, n=25	4.05 0.82, n=24
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	4.24 ±0.71, n=25	3.75 ±0.97, n=24	3.96 ±0.96, n=25	3.91 ±0.67, n=24
d. An ability to function on multidisciplinary teams	3.56 ±1.42, n=25	3.38 ±1.36, n=24	3.68 ±1.38, n=25	3.32 ±1.36, n=24
e. an ability to identify, formulate, and solve engineering problems	4.52 ±0.57, n=25	4.33 ±0.62, n=24	4.44 ±0.57, n=25	4.29 ±0.55, n=24
f. An understanding of professional and ethical responsibility	3.88 ±1.21, n=25	3.35 ±1.20, n=24	3.68 ±1.49, n=25	3.23 ±1.17, n=24
g. An ability to communicate effectively	3.36 ±1.47, n=25	3.22 ±1.32, n-24	3.56 ±1.27, n=25	3.45 ±0.99, n=24
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	4.08 ±1.20, n=25	3.54 ±1.04, n=24	3.96 ±1.04, n=25	3.77 ±0.79, n=24
i. A recognition of the need for, and an ability to engage in life-long learning	4.08 ±1.02, n=25	3.71 ±0.89, n=24	3.92 ±1.35, n=25	3.86 ±0.92, n=24
j. A knowledge of contemporary issues	3.60 ±1.36, n=25	3.04 ±1.31, n=24	3.60 ±1.36, n=25	3.27 ±1.14, n=24
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	4.44 ±0.90, n=25	3.83 ±1.07, n=24	4.36 ±0.84, n=24	3.95 ±0.88, n=24

Note: Numbers shown are: Mean ± Standard Deviation, n=sample size

3.2.4 *Senior Exit Interview:* Results of a recent Senior Exit Interview are presented in Table 3-3. Comments by graduating students are important to faculty and provide valuable input on how well the SLOs are being attained. Results of the Senior Exist Interview also point out some strengths and shortcomings in the program which are addressed as part of the CQI process.

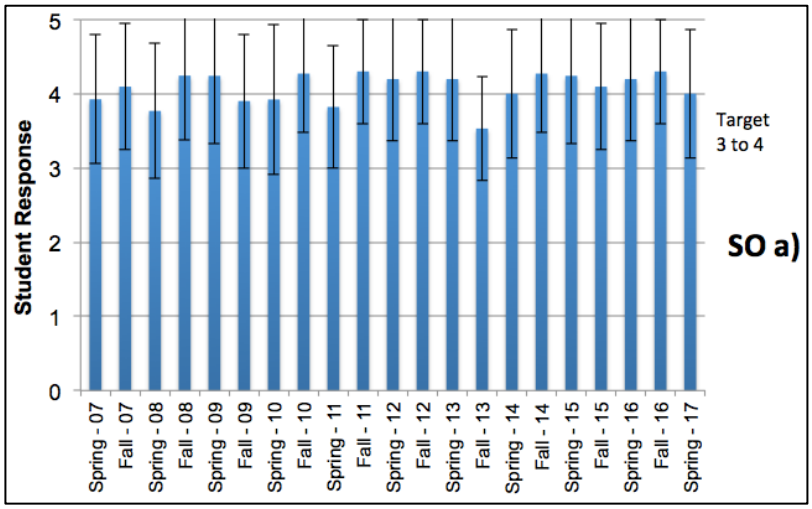

Figure 3-5 Results of Course Surveys for SLO a) from Spring 2007 until Spring 2017

Table 3-4 Summary of Senior Exit Interview

Topic	Response
Participation in professional organizations	Several students in the group indicated that they were members of *Student Professional Organizations* such as ASME (17), ASHRAE (4), SAE (5), SWE (5), SHPE (3), and NSBE (0). Very few students participated in more than one organization and few students held position of officers in the organization. • ***Industry Experience*:** An increase of more than fifty-percent of students had Industry Internship Experience. Participants in the *VIP Program,* organized by Lyles College of Engineering, were *very satisfied* with the experience they gained. However, the program offered *limited number* of Internship positions. Students felt that the Internship positions announced by the *Placement Center* mostly related to non-engineering jobs and did not have major impact on engineering majors. Mechanical Engineering students want more opportunities for internships with a broader professional spectrum for example motor vehicles machines, giving them more exposure and work experience. An estimated 22% of graduating class networked to find employment by attending national conferences, on campus recruiting, person-to-person contact and career fairs. Four students wrote on their survey that they had part-time position inside of their field. • ***Preparedness for Professional Certification*:** Students seem to have clear understanding of Professional Engineering (PE) licensing, about ten-percent of students took the EIT/FE exam, and passed and other students plan on taking the EIT/FE exam prior to graduation. Students requested workshops for preparation for professional exams and also fee waivers if they pass the exam to get reimbursed by the Mechanical Engineering Department.
Academic Advising	The response from students vastly varied in range, from very much satisfied (6) to satisfied (27), while (32) indicated that they need another category like, moderately satisfied. Students provided the following suggestions to improve their advising experience. • Some transfer students said some advisors miss informed them. Transfer students stated they need more guidance on how to read a roadmap. • Advisors should have more training on how the system works by receiving training and keeping up to date on course requirements. • Advising should not be assigned to new faculty who are not familiar with the program sequence and pre-requisites. If it becomes necessary to assign advising to new faculty, they should be mentored by experienced faculty. • Offering almost all the courses every semester has made sequencing of courses less problematic. • The LCOE advising center has added confusion to advising mix because the advice received from the college center is not always as complete or consistent with advice received from ME faculty. • The number and variety of registration holds placed on students has not only increased but it is not always clear who can place or release these holds. This often leads to delays in registration.
Univ. Education Experience and Life on Campus at CSU, Fresno	Majority of students (41) was satisfied with the educational and student services University provides. Students want better access to computer labs; updated software, renovate facility, more professors to assist students in graduating in 4 years instead of 6 years. More recommendations are below. • Transfer students want workshops offered for Matlab, because some transfer students may not have the same amount of experience, with the software. • Professors need to communicate better and make things easier to understand. • Need better work areas, machine shops and technicians. • Have professors take credentials course and hire professors with industry experience.
Professional growth	The following suggestions were made to enhance their professional growth in the ME Program • Early in the program, students should be informed about the opportunities that exist for Mechanical Engineers and provide a road map for achieving their career goals. • Encourage Student Professional Clubs to interact with Industry and organize sponsored projects. • Encourage students to participate in the Design Projects that meet the requirement of National and Regional Competitions, such as SAE Formula Car/ASME-HPV/HVAC National Design, and allow credit for the work done on the project towards design units required for the degree.
Educational Experience Provided in ME program	More than half of Mechanical Engineering students were satisfied with the ME program curriculum and course offerings. However, there were some negative comments on courses offered in the program. The areas that pertain to negative comments must be reviewed and appropriate corrective action should be taken, if they are not already addressed..
Mechanical Engineering Curriculum	The students were satisfied with the ME program curriculum and course offerings. However, there were some positive and negative comments on courses offered in the program. The areas that pertain to negative comments must be reviewed and appropriate corrective action be taken, if they are not already addressed. The comments made by students are listed here. • ME 31: Materials, is very good course and well presented. Topics on polymers, if added to the course, or given as an advance course will be appropriate. • ME142 Vibrations and ME122 Controls are currently technical electives. They should be given as mandatory courses to strengthen the design area. • Specialty and teaching experience of a faculty should be considered when teaching assignments are made. • The department must consistently assign a course coordinator to oversee the uniformity of course content and presentation, group discussions and oversight among faculty who teach similar courses, will be helpful. • Faculty must come prepared to class and post course material and assignment on the Blackboard. • Senior level courses must be application-oriented and integrate with design courses.

Table 3-4 Summary of Senior Exit Interview (cont'd)

Courses taken from other engineering disciplines (CE and ECE) were relevant to ME curriculum	• CE 121: Make it optional and make some ME courses like ME 142 mandatory. • Too many freshmen take up classes and take away instructors from upper level classes in Mechanical Engi Department. • Offer more courses year-round at various times. • Continuity between classes; keeping professors accountable to expected criteria, give professor more evaluations • The quality of instruction of courses offered in Thermal area, varied very much, from one instructor to another. • Specialty and teaching experience of a faculty should be considered when teaching assignments are • More S.I. courses should be offered. • Students had the desire to incorporate more hands on experience in the classroom; they requested mach courses (fabrication).
Preparation in Math, Physics, and Chemistry courses	*The following comments were made by the students in regards to non-engineering courses, required in the program.* ▪ A few professors are teaching MATH series (75/76/77/81) and the professors have never taken the course before, teach us? ▪ Math series was very helpful and it provides a foundation for engineering course work. ▪ Physics series: Great program! ▪ Chemistry 1A: The lab professor was not passionate about teaching the course. ▪ Give ME students the possibility to test out of Chemistry 1A. ▪ Most of the Mechanical Engineering graduating class took their Math, Physics, Chemistry, Speech, and Politic a Jr. College. ▪ Some students felt PL SCI 120 was a waste of time and not essential to assist with their career. ▪ Political Science is helpful class to introduce students to domestic and foreign affairs policies.
General Education Courses	The following comments were made with regards to required GE Courses. • Courses offered in Speech/Communication Series (Comm: 3, 7, and 8) Students were satisfied with course offerir felt Engineers need to learn to be good speakers. They need Speech class to prefect their skills in talking in front *Other comments and suggestions:* • Offer more course per semester • Hire more faculty with classroom experience • Figure out how to relate Chemistry to Thermo and Engineering courses.
General Concluding Remarks on ME Curriculum	• More than fifty-percent of students were satisfied with Fresno State program. • Mechanical Engineering students seem to want more hands on experience and internship opportunities relating and outside of the VIP program. • Scheduling should not change once course go live, it happens too often. • Most students seemed satisfied but the following suggestions were made by ME students to improve the ME pro • Make ME 156 an elective and replace that course with ME 162, Vibrations or Controls. • Implement industry standards. • Thermodynamics lectures need improvement a long with Heat & Mass transfer. • ME 2 should focus on Matlab and Excel, with very little use on Word. • ME 26 should include GD&T, and should teach CAD & SEI the perspective of manufacturing. • Don't make 1 unit courses harder than 3 units' courses. • Have professors facilitate students going on national conferences. Most conferences are one week long and stu about one week prior to research companies. That is a lot of time where classes are still going on. • Split ME 140 into two classes. • Breakup ME 145 in to two classes. • ME 2 or 26 needs to be revamped. • ME 2 should be a Matlab and a little excel. • ME 1 should focus on lab report writing. • Funding for research projects. • Professor research presentations from Fresno State or CSU's or UC's. • Offer senior design both fall and spring. • ME 166 is not necessary for the Mechanical Engineering major. • Students learned a lot about Solid Works but they hear most industries use Ansys. • Students are requesting less book problems and more practical application from materials. • Refine the following courses to focus on the following: ME 1 -Teach writing labs report, ME 2- more excess to M more need for application of drafting.
Final Comments and suggestions	• Mechanical Engineering graduating students were unhappy with ME 136 Thermodynamics and ME 145 Heat M ME students want the professors to be more prepared and give clear direction. • Too many freshman are in ME major courses that seniors need to graduate. • The ME department should implement a department-wide standard for lab reports, so that it is consistent throug program and across labs.
Preparedness for Entry Level Jobs	The seniors were asked to rate their preparation to fill entry level mechanical engineering positions in industry, as they with a BSME. Their responses were that about 83% felt that they were well prepared to take up entry level positions, they were not prepared able to take up a job.

3.2.5 *Co-op internship Survey:* Dating back to 2007, over 80 ME students have completed an appraisal of their experiences in the middle of their internship and following completion of an internship program with a company. The general response was that the students found the internship to be a very valuable experience. Results of the Fall 2016 internship survey are shown in Table 3-5. There is no real target other than a 50% or greater appraisal is deemed acceptable.

Table 3-5 Co-op/Internship survey; VIP Program performance appraisal
(4-5 = High, 3-4 = Medium, 2-3 = Low, 1-2 = Weak)

Program Attributes	Rating: Mean±1 sd	% Mean Rating	Number of Respondents
Your academic preparation	3.11±0.33	62%	22
Your preparation for work environment	3.22±0.83	64%	22
Executive Director's involvement with your internship	4.11±0.60	82%	22
VIP program support of internship and company	4.33±0.50	87%	22
Univ/College support of internship and/or VIP program	3.33±0.50	67%	22
VIP program communications (verbal, written)	4.33±0.87	87%	22
VIP program cooperation (attitude, willingness)	4.56±0.53	91%	22
VIP program organization and structure	4.11±0.33	82%	22
Mentor involvement with your internship	4.11±0.93	82%	22
Would you recommend VIP program to other students	4.89±0.33	98%	22
Company internship assignments	4.33±0.50	87%	22
Company work environment	4.33±0.71	87%	22
Your attitude about working for the *Company*	4.44±0.73	89%	22
Recommend this *Company* to another VIP student?	4.56±0.53	91%	22

4.What changes did you make as a result of the data? Describe how the information from the assessment activity was reviewed and what action was taken based on the analysis of the assessment data.

Some but not all changes are listed here.

4.1 Implementation of higher first-time freshman admission indices for ME (e.g., service area (using SAT): 3500 for ME vs. 3100 for university and out of area (using SAT): 3900 for ME vs. 3900 for university) along with stricter transfer student requirements, change of major requirements (e.g., minimum GPA of 3.0 and completion of MATH 75) and pre-requisite requirements (e.g., C or better in engineering, math and science courses) are increasing quality and decreasing attrition by attracting better quality students. Unfortunately, the demand for the ME major is such that despite a decrease in first time freshman (FTF) from 135 in Fall 2015 (last pre-impaction year) to 92 and 90 in Fall 2016 and Fall 2017 (post impaction), respectively, the total number of BSME students continues to increase due to a steady number of transfer students and increasing number of returning students (see Figure 4-1).

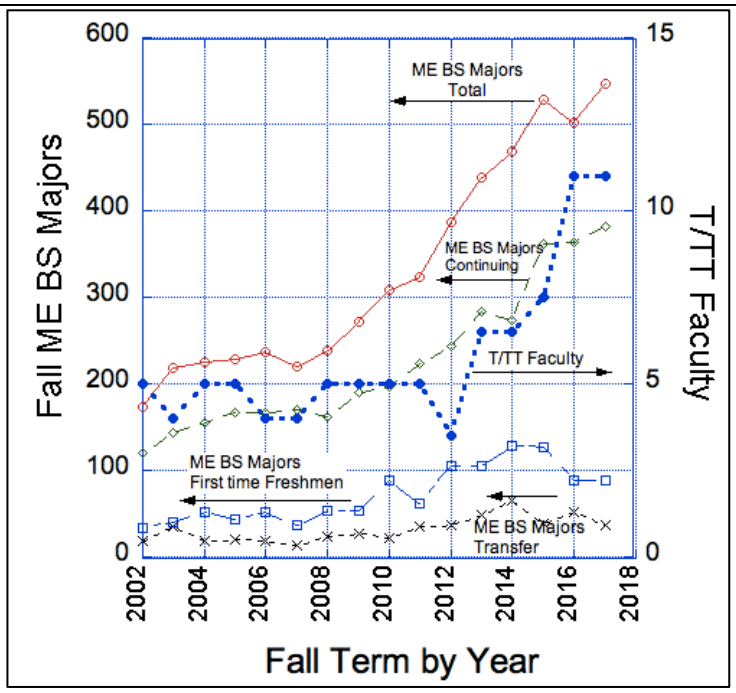

Figure 4-1 BS enrollment in ME (FTF, Transfer, Continuing and Total) along with Number of T/TT Faculty

4.2 Two new tenure track faculty in Energy and Fluids (E&F) and two in Systems, Dynamics, Controls (SDC) joined the department in Fall 2016. These new faculty have strengthened teaching in those areas, subsequently reducing the number of required lecturers and thereby increasing quality and consistency of teaching and advising. It is too early to see the direct effects of the increase in T/TT faculty but better advising and better student:faculty ratios are increasing the quality of the educational experience.

4.3 The Department has been divided into four Interest Areas: Design (D); Energy and Fluids (E&F); Mechanics, Materials and Manufacturing (MMM); and Systems, Dynamics and Controls (SDC). Faculty who are assigned (or choose) interest areas become coordinators for specific courses and are able to focus on a subset of courses rather than being spread across the entire BSME curriculum. Increasing consistency in attainment of targets for SLOs specific to these courses is evidence in support of this organizational change.

4.4 A new faculty search to fill a position in the Design (D) interest area was initiated in Spring 2017 and is ongoing through Fall 2017 with a hiring target of Spring 2018. Assessment results show that lack of depth of faculty in the Design area may jeopardize future success not only of design courses but also the achievement of SLOs connected to these courses.

4.5 Curricular changes have resulted in a robust and consistent two-course/two-semester Senior Capstone Design sequence (ME135 and ME155). There are three-fold reasons for this two –course sequence: i) the design projects provide synthesis of pre-requisite course material in externally-sponsored, hands-on culminating real-world design experiences; ii) the accreditation body, ABET, for the BSME degree requires such culminating experiences as part of the accreditation criteria and ii) both ME135 and ME155 address all eleven SLOs for the program in their CLOs and therefore can reflect the success of the ME program. Analysis of student performance assessment results indicate that that this change is increasing the performance in both courses as shown in Figure 3-4.

Table 4-1 Interest Groups by Faculty Expertise and Undergraduate Course

Design **(D)**	**Energy and Fluids** **(E&F)**	**Mechanics, Materials, Manufacturing (MMM)**	**Systems, Dynamics, Controls (SDC)**
Faculty	**Faculty**	**Faculty**	**Faculty**
The Nguyen (Asst Prof) Walter Mizuno (Lec) Newbie (Fall 2018)	Mazen Eldeeb(Asst Prof) Deify Law (Asst Prof) Zhi Liang (Asst Prof) Ajith Weerasinghe (Asst Prof)	Sankha Banerjee (Asst Prof) Maziar Ghazinejad (Asst Prof) Michael Jenkins (Prof)	Dare Afolabi (Assoc Prof) Gemunu Happawana (Assoc Prof) Farbod Khoshnoud (Assoc Prof)
UG Courses	**UG Courses**	**UG Courses**	**UG Courses**
• ME 2. Comp App ME • ME 26. Eng Graph • ME 125. Eng Stats and Exp • ME 135. Sr Capstone Design I • ME 140. Adv Eng Analysis • ME 155. Sr Capstone Design II • ME 162. Comp-Aided Design (CAD)	• ME 116. Fluid Mech • ME 118. Fluid Mech Lab • ME 136. Thermo I • ME 137. Turbomachine • ME 145. Heat & Mass Transfer • ME 146. Air Condition • ME 156. Thermo II • ME 166. Energy Systems Design	• ME 31. Eng Mat • ME 32. Eng Mat Lab • ME 95. Manuf Proc • ME 144. Adv Mech of Mat • ME 154. Design of Mach Elements • ME 159. Mech Eng Lab • ME 164 Mech Systems Design	• ME 29. Engineering Mechanics • ME 112. Eng Mech: Dynamics • ME 115. Instr & Measurement Lab • ME 122. Dyn Systems & Controls • ME 134. Kinematics of Machinery • ME 142. Mech Vibration

4.6 More technical elective (TE) offerings (formerly two per semester, now four per semester) provide greater variety for students and reflect expertise of new faculty. In addition, graduate students (who can use up to six units of upper division undergraduate coursework toward their graduate degree) now have more access to these courses. Assessment results indicate that students prefer more variety in their technical choices.

4.7 A common ME syllabus format using the university template as a basis has provided several advantages: i) better accessibility because of the use of the university template and guidelines, ii) expanded section on plagiarism and cheating removes student confusion related to the application of APM 235 and iii) graphical map of CLOs to SLOs demonstrates to both faculty and students the contribution of each course to the programmatic SLOs.

4.8 Consistent and regular Implementation of both formative assessments (i.e., weekly quizzes and group activities) and summative assessments (midterm and final exams) has been applied in most ME courses. Evaluation of assessment results through both quantitative and qualitative means has indicated that student interaction and regular feedback improves retention and the quality of the educational experience.

4.9 Consistent and regular implementation of active learning environments (e.g., in-class group activities, team-based projects, assigned study groups, etc.) have been introduced, as appropriate, in many ME courses. Evaluation of assessment results through both quantitative and qualitative means has indicated that application of a “flipped classroom” environment improves retention and the quality of the educational experience.

4.10 To provide more uniformity in format, consistency in expectations and fairness in grading, common rubrics and common formats for written reports (lab and research) and oral presentations are being introduced in most courses with communication components. Assessment results for oral and written communication show the need for uniformity in format and grading.

4.11 Evolving curriculum changes include the following: i) potentially creating a new course ME70 Intro to Programming using MatLab™ to replace the current ECE71 Intro to Programming to strengthen and augment student proficiency in numerical methods, ii) modify the current ME01 Intro to ME and ME02 Computer Applications in ME to enhance and strengthen the freshman engineering experience not just at CSU, Fresno but also at the community college, pre-engineering programs, iii) add a unit to ME95 Manufacturing Processes to strengthen the product realization offering and provide a broader range of manufacturing experiences beyond conventional machining, iv) require a specific course to fulfill the UDWR, in this case ENGR105W Engineering and Entrepreneurship in order to strengthen and improve technical writing skills as well as provide business sense of engineering.

5. What assessment activities will you be conducting in the 2017-2018 AY? List the outcomes and measures or assessment activities you will use to evaluate them. These activities should be the same as those indicated on your current SOAP timeline; if they are not please explain.

See the table from the SOAP for activities in the 2017 and 2018 years, shown here as Tables 5-1 and 5-2.

Table 5-1 Assessment Methods mapped to SLOs

Assessment Method	Student Learning Outcome (SLO)										
	a	b	c	d	e	f	g	h	i	j	k
Direct Methods											
Fundamentals of Engineering (FE) Examination	X	X	X		X	X		X			X
Student Performance in Courses	X	X	X	X	X	X	X	X	X	X	X
Culminating Capstone Design Experience	X	X	X	X	X	X	X	X	X	X	X
Indirect Methods											
Junior Survey	X	X	X	X	X	X	X	X	X	X	X
Senior Survey	X	X	X	X	X	X	X	X	X	X	X
Course Survey	X	X	X	X	X	X	X	X	X	X	X
Senior Exit Survey	X	X	X	X	X	X	X	X	X	X	X
Co-op internship Survey	X	X	X	X	X	X	X	X	X	X	X

Table 5-2 Assessment Methods Timeline

	Type	Technique	Timeline (Year)							Frequency
			2015	2016	2017	2018	2019	2020	2021	
Goals =Program Educational Outcomes	"Indirect"	Alumni Survey			☑ (S)			☑ (S)		Two periods in six years
		Employer Survey		☑ (F)			☑ (F)			Two periods in six years
		IAC Feedback		☑ (F)		☑ (F)		☑ (F)		Three periods in six years
Student Learning Outcomes	"Direct"	FE Exam Results	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	Semester
		Student Performance in Courses	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	Semester
		Culminating Capstone Design Experience	☑ (S)	☑ (S)	☑ (S)	☑ (S)	☑ (S)	☑ (S)	☑ (S)	Annual
	"Indirect"	Jr Survey	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	Semester
		Sr Survey	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	Semester
		Course Survey	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	☑ (F) ☑ (S)	Semester
		Sr Exit Interview	☑ (S)	☑ (S)	☑ (S)	☑ (S)	☑ (S)	☑ (S)	☑ (S)	Annual
		Co-op/Intern Survey		☑ (F)		☑ (F)		☑ (F)		Three periods in six years

6. What progress have you made on items from your last program review action plan? Please provide a brief description of progress made on each item listed in the action plan. If no progress has been made on an action item, simply state "no progress."

6.1 Action Item: Recruit three-five new tenure track faculty**. Result:** Four new tenure-track faculty joined the ME faculty in Fall 2016**.** Dr. Mazen Eldeeb and Dr. Zhi Liang joined the Energy and Fluids (E&F) interest group with Dr. Eldeeb starting as lecturer in January 2017 and transitioning to assistant professor in August 2017 and Dr. Liang starting as assistant professor in August 2017. Dr. Dare Afolabi and Dr. Farbod Khoshnoud joined the Systems, Dynamics, Controls interest group in Fall 2016, both as associate professors. Although eight new faculty have been hired since 2011, three faculty have left (two resignations and one retirement). As of Fall 2017, there are 11 tenure/tenure-track faculty and one full-time lecturer in the Department of Mechanical Engineering serving about 600 undergraduate and graduate students. A search is in progress during 20017-18 AY to hire an additional tenure track faculty in the Design interest area.

6.2 Action Item: Upgrade existing teaching/research laboratories. **Result:** Three laboratories in Engineering West that serve ME were renovated (May 2016 to December 2016 renovation at an expense of ~$250,000) and a four-unit, outdoor laboratory annex (August 2016 to August 2017 construction at an expense of ~$400,000) was completed to augment the undergraduate design experiences. [100% complete]

6.3 Action Item: Reconfigure (Engineering West) EW Building to establish better fabrication facilities, project space and a design studio. **Result:** Renovation of three laboratories in Engineering West (EW) and opening of the four-unit, outdoor laboratory annex (EW Annex) were completed by Fall 2017. Other facilities in EW are in the process of being reconfigured and repurposed to improve its efficiencies. In particular, EW 125 will become the new student project area and EW 128 will become the new manufacturing processes shop. [in process and about 5% complete]

6.4 Action Item: Define and maintain caps on ME majors (e.g., 300-400 undergraduate and 25 graduate). **Result:** This goal is being implemented as part two step process although the goal for graduate students has increased from 25 to 40:

Step 1 – Use university impaction to control admissions by increasing admissions Index from 2900 to 3500 for first time freshmen from the service area. An additional plan is to increase standards for transfer students such as minimum GPA of 2.5 as well as completion of all math and science lower division requirements. [in progress and about 75% complete]

Step 2 – Control sustained enrollment by i) requiring MATH 75 (or its equivalent) for all lower division ME courses except ME01; ii) requiring C or better in all engineering courses and those math and science courses that do not already have this in place (e.g., CHEM1A and MATH81) (in addition to the C or better already in place for MATH and PHYS attainment), iii) automatically denying third attempts for courses for any BSME major, iv) requiring a minimum GPA of B and completion of MATH 75 for change of major, v) actively providing counseling direction to alternate majors for those students who are demonstrating low probability of success in the BSME major. [in progress and 100% complete]

6.5 Action Item: Limit enrollment maximums per undergraduate course section (e.g., 15 for lab and 35 for lecture). **Result:** These goals were partially implemented in AY2015-16 but in AY2016-17 were modified to maximum enrollments per course section of 12 and 35 for lab and lecture, respectively. These changes were fully implemented in Fall 2017 for AY2017-18. The result was that for ME undergraduate lecture courses, 30 sections were offered in Fall 2016 with total enrollment of 951 for an average enrollment per lecture section of 32. In Spring 2017, 28 lecture sections were offered with total enrollment of 852 for an average enrollment per lecture section of 30. Similarly, for ME laboratory undergraduate courses, 16 sections were offered in Fall 2016 with total enrollment of 233 for an average enrollment per lab section of 15. In Spring 2017, 25 lab sections were offered with total enrollment of 406 for an average enrollment per lab section of 16. Finally, in Fall 2017, average enrollment in 31 lecture undergraduate courses is 30 and in 20 laboratory undergraduate courses is 12. [100% complete]

6.6 Action Item: Define impaction terms to increase quality and decrease attrition. **Result:** Impaction results are as follows. The goal of impaction is to not trade quality for quantity. The BSME is a high-demand professional major across the United States with the BSME program at CSU, Fresno being no exception. For Fall 2015, before impaction, the number of ME applications was 707 with 392 admits resulting in 135 enrolled first-time freshman ME majors. For Fall 2016, after impaction, the number of ME applications was 631 with 336 admits resulting in 92 enrolled first-time freshman ME majors. For Fall 2017, a year after impaction, the number of ME applications was 533 with 315 admits resulting in 88 enrolled first-time freshman ME majors. Because impaction should positively affect the preparedness and hence quality of incoming

freshmen, one measure of the success of impaction is the retention of students from freshman to sophomore year. For Fall 2015, 162 total freshmen and 73 sophomores were enrolled in the BSME program but by Fall 2016, there were 122 total freshmen and 79 sophomores. Thus, the while the total number of freshmen is decreasing, the number of sophomores is increasing. Another measure of impaction is graduation rate, but the effects will not be seen for many years. Anecdotal evidence from faculty and students indicates that the efforts to increase preparedness and quality of students is increasing the quality of the learning experience (both student/teacher interaction, less time spent on remediation, more time spent on appropriate or advanced topic, better quality and successful projects, etc). For AY2017-18, the department is pursuing impacting the BSME program based on the obvious high demand outstripping available capacity. [in progress but impaction appears to be having the desired effect]

6.7 Action Item: Finalize, publicize, and implement focal areas for BSME (e.g., advanced materials, alternative energy, mechatronics). **Result:** Documents have been published and website updates have been posted. Equipment has been procured to support these focal areas. Eight new faculty have been hired in the last few years to provide intellectual horsepower in four interest areas (e.g., D, E&F, MMM, SDC) for these focal areas. [in progress but nearly 100% complete]

6.8 Action Item: Maintain national accreditation. **Result:** The BSME program is currently accredited by EAC of ABET to 30 September 2019. This accreditation period represents a period of six years. The upcoming reaccreditation requires submission of a self study in June 2018 and a site visit in Fall of 2018. For the BSME program, accreditation is based on successful maintenance of eight Engineering Accreditation Commission (EAC) criteria (1. Students, 2. PEOs, 3. SOs, 4. CQI, 5. Curriculum, 6. Faculty, 7. Facilities, and 8. Institutional Support) and two ASME professional criteria (1. Curricular preparation for professional practice and 2. Faculty remaining current). This maintenance requires continual attention to these criteria. During the upcoming 2017-18 AY the comprehensive self study will be completed in preparation for the site visit in Fall 2018. [in progress but 100% complete for now]

Additional Guidelines: If you have not fully described the assignment then please attach a copy of the questions or assignment guidelines. If you are using a rubric and did not fully describe this rubric (or the criteria being used) than please attach a copy of the rubric. If you administered a survey please consider attaching a copy of the survey so that the Learning Assessment Team (LAT) can review the questions.

Not applicable or see SOAP for forms/survey.