Introduction to the Mechanical Engineering Department

The Mechanical Engineering Department was formally established in 1958 and houses both BSME and MSME programs. The BSME program is accredited through ABET (Accreditation Board for Engineering and Technology).

Effective Fall 2014, the BSME curriculum will consist of general education courses, 30 units of math/chemistry/physics, 60 units of required major courses, and 9 units consisting of a capstone design course in the area of thermal/fluids, mechatronics, or mechanical design, and 2 electives. The MSME program consists of two required courses and courses chosen from one of the three focus areas. For a culminating experience, students either complete a two-semester MS project or thesis or else take two extra electives and a comprehensive exam for a total of 30 units. In Fall 2013 there were 693 BSME majors (up from 525 in Fall 2012) and 96 MSME students for a total of 339.6 FTES in ME courses.

Noted department strengths include a dedicated, highly qualified faculty including 9 full time faculty members and a large number of adjunct faculty working in industry, a strategic location in the Silicon Valley that allows for significant interaction with industry, and a hands-on educational program that has been recognized both by our ABET evaluator and through numerous awards in design competitions.

1. List of Program Learning Outcomes (PLOs)

In the BSME program, we have both Program Education Objectives, which outline what we want out graduates to have achieved 3-5 years after graduation, and Student Learning Outcomes, which outline what we want our students to have achieved by the time they graduate.

Program Educational Objectives
The Program Educational Objectives for the Mechanical Engineering program are as follows:

Within a few years of graduation, our graduates are expected to:
1. Apply engineering knowledge and skills to make positive impact on society through employment in industry, advanced study, and/or public service;
2. Communicate effectively and perform professionally in both individual and multi-disciplinary team-based project environments;
3. Be engaged in and continue to engage in lifelong self-directed learning to maintain and enhance their professional skills;
4. Determine and respond to ethical implications on issues such as public safety and intellectual property protection, and also reflect on global and societal impacts of engineering solutions to contemporary problems.

The Mechanical Engineering Program Educational Objectives (PEOs) have been developed to be consistent with the mission of (a) San Jose State University (SJSU), (b) the College of Engineering and (c) the Department of Mechanical Engineering. These PEO’s were chosen by the ME faculty after a significant amount of discussion during faculty meetings, a faculty retreat, and via email. They were developed based on faculty experience, evaluation of other ME programs throughout the country, and ABET guidelines. The Department Advisory Council met in March 2011 to evaluate whether they believed that these are the proper PEO’s for our department, and we also receive feedback from our alumni through surveys administered every 2-3 years.

Student Learning Outcomes
By the time they graduate, our students are expected to have acquired 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 multi-disciplinary 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.

The Student Learning Outcomes (SLOs) are achieved primarily through the program curriculum, which is designed to emphasize problem solving, design skills, communication skills, and experiential learning. We expect that ME graduates have attained the abilities to achieve professional accomplishments in their early engineering career through the knowledge and skills that they acquired from the program as outlined by the SLOs. These gained abilities/skills from the program in turn will foster successful attainment of the PEOs when alumni apply them in the workplace. These SLOs are the 11 outcomes required by our accreditation agency, ABET. Table 1 shows the relationship between the PEOs and SLOs.
Table 4 in Section 3 demonstrates the measures used by the students to show achievement of the SLOs. PEOs are assessed using surveys of alumni. The most recent survey closed on February 28, 2014 with 64 responses.

Table 1 Relationship between PEOs and SLOs

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEO # 1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>PEO # 2</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEO # 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEO # 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

2. Map of PLOs to University Learning Goals (ULGs)

Table 2 shows the relationship between the SLO’s and the University Learning Goals. The BSME SLO’s show good overlap with all the ULG’s.

Table 2 Map of BSME Student Learning Outcomes to University Learning Goals

<table>
<thead>
<tr>
<th>University Learning Goal:</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized Knowledge</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Broad Integrative Knowledge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intellectual Skills</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Applied Knowledge</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social/Global Responsibilities</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. **Alignment – Matrix of PLOs to Courses**

Table 3 shows where the BSME outcomes are covered and assessed, where H indicates a more coverage and typically a higher level of expected proficiency compared to M, which indicates medium coverage. Checks indicate coverage that is not assessed. Only required courses are included on this table. Table 4 lists the measures used for assessment.

<table>
<thead>
<tr>
<th>Student Learning Outcomes</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>j</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr 10</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>M</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Engr 100W</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>H</td>
<td>✓</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>ME 101</td>
<td>M</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 106</td>
<td>✓</td>
<td>✓</td>
<td>M</td>
<td>M</td>
<td>H</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>H</td>
</tr>
<tr>
<td>ME 111</td>
<td>M</td>
<td>✓</td>
<td>M</td>
<td>✓</td>
<td>✓</td>
<td>M</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 113</td>
<td>M</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>H</td>
<td>✓</td>
<td>H</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 114</td>
<td>H</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>H</td>
<td>✓</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 115</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>M</td>
<td></td>
<td></td>
<td>M</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 120</td>
<td>M</td>
<td>H</td>
<td>✓</td>
<td>✓</td>
<td>H</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 130</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 154</td>
<td>✓</td>
<td>M</td>
<td>✓</td>
<td>H</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>H</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 195 A, B</td>
<td>✓</td>
<td>H</td>
<td>H</td>
<td>✓</td>
<td>M</td>
<td>✓</td>
<td>H</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

*M: Medium contribution  H: High contribution  ✓ Skills relevant but not presently assessed*
### Table 4  Assessment Processes for Each SLO

<table>
<thead>
<tr>
<th>Outcome 3a</th>
<th>Outcome 3b</th>
<th>Outcome 3c</th>
<th>Outcome 3d</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 101 final exam</td>
<td>ME 120 individual lab reports</td>
<td>ME 154 group design report</td>
<td>ME 106 term project reports</td>
</tr>
<tr>
<td>ME 111 homework assignment</td>
<td>ME 120 individual oral pres.</td>
<td>ME 154 homework assignment</td>
<td>ME 106 performance eval. forms</td>
</tr>
<tr>
<td>ME 113 gateway quizzes</td>
<td>ME 120 group project report</td>
<td>ME 154 quizzes</td>
<td>ME 195 project topics F10</td>
</tr>
<tr>
<td>ME 113 final exam question</td>
<td></td>
<td>ME 106 individual lab reports</td>
<td>ME 195 performance evaluation forms</td>
</tr>
<tr>
<td>ME 113 final exam grade</td>
<td></td>
<td>ME 106 group project report</td>
<td></td>
</tr>
<tr>
<td>ME 114 quiz</td>
<td></td>
<td>ME 195 group project reports</td>
<td></td>
</tr>
<tr>
<td>ME 120 homework assignments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 130 final exam question</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome 3e</th>
<th>Outcome 3f</th>
<th>Outcome 3g</th>
<th>Outcome 3h</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 111 homework assignment</td>
<td>Engr 10 homework assignments</td>
<td>ME 115 lab report</td>
<td>ME 113 papers</td>
</tr>
<tr>
<td>ME 106 term project, mini-project</td>
<td>Engr 10 final exam questions</td>
<td>ME 120 individual oral pres.</td>
<td>ME 195 group project reports</td>
</tr>
<tr>
<td>and lab exercises</td>
<td>ME 195 quiz</td>
<td>ME 120 lab reports</td>
<td></td>
</tr>
<tr>
<td>ME 154 project</td>
<td>ME 195 group project reports</td>
<td>Engr 100W exit exam</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8 Engr 100W written assignments</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ME 195 oral presentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome 3i</th>
<th>Outcome 3j</th>
<th>Outcome 3k</th>
</tr>
</thead>
<tbody>
<tr>
<td># of students involved with clubs</td>
<td>ME 111 group project reports</td>
<td>ME 106 individual lab reports</td>
</tr>
<tr>
<td># of student competition awards</td>
<td>ME 113 exam questions</td>
<td>ME 113 assignment</td>
</tr>
<tr>
<td>ME 111 group project reports</td>
<td>ME 113 papers</td>
<td>ME 115 computer assignment</td>
</tr>
<tr>
<td>Engr 100W assignment</td>
<td>Engr 100W assignment</td>
<td>ME 154 assembly drawings</td>
</tr>
<tr>
<td>student survey</td>
<td></td>
<td>ME 154 assignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ME 154 group design report</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ME 154 presentation or DVD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Planning – Assessment Schedule

Our plan is to go through two complete assessment cycles of the undergraduate program before the next ABET accreditation visit (six years from our last visit). The following schedule is being followed:

2011-12: Outcomes f, j
2012-13: b, d, g, h
2013-14: a, c, e, i
2014-15: k, f, j, b
2015-16: d, g, h, a
2016-17: c, e, i, k

Individual course instructors collect the data as listed in Table 4, and course coordinators analyze the results. The ME Associate Chair coordinates the results at the end of each semester or academic year. Based on the results and analysis, the Associate Chair and the department’s Undergraduate Studies Committee work together to make recommendations for improvement. Improvements are implemented the following year and then assessed again during the next assessment cycle – or the next year if there is a serious deficiency.

All students in the BSME program must achieve a C- or better in each class in their major. Thus, this grade is considered the minimum acceptable achievement for a student. Realistically, all students will not achieve a C- or better for all assignments. Thus, all outcomes are assessed using assignments from multiple classes. When one or two assignments are assessed, the goal is to have 100% of students achieve the target level on at least one. If more assignments are assessed, the goal is 70% achievement. Over time as the program improves, this goal of 70% achievement can be increased since truly the ideal is 100% achievement of each assignment and outcome.

Since the PEOs represent the expectation of our graduates, they are assessed using surveys of alumni 3-5 years after graduation. A survey was just closed on February 28, 2014 with 64 responses, and another survey will be sent out in Spring 2016 so that we will have a minimum of two rounds of surveys per 6-year ABET assessment cycle. We also meet every semester with our Industrial Advisory Board to receive feedback and recommendations for improvements from the employers of our graduates.

5. Student Experience

The BSME PEO’s and SLO’s are included on our department website. Students have some knowledge of outcomes, but they are not included on most syllabi, and discussions are occasional, largely limited to the capstone design and senior project courses. Feedback from alumni was incorporated into the development of the outcomes but not current students.
Part B

6. Graduation Rates for Total, Non URM and URM students (per program and degree)

Table 5 BSME Graduation Rates

<table>
<thead>
<tr>
<th>Academic Programs</th>
<th>First-time Freshmen: 6 Year Graduation Rates</th>
<th>New UG Transfers: 3 Year Graduation Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fall 2007 Cohort</td>
<td>Fall 2010 Cohort</td>
</tr>
<tr>
<td></td>
<td>Entering</td>
<td>% Grad</td>
</tr>
<tr>
<td>Mechanical Engineering</td>
<td>Total</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>URM</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Non-URM</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>7</td>
</tr>
</tbody>
</table>

Our graduation rates for first time freshman are lower than we would like; the numbers for underrepresented minorities are particularly troubling. The total graduation rate increases to 70% for the 8-year graduation rate for freshmen and 73.1% for the 5-year grad rate for transfer students (both based on final major). Our students are taking mostly math/science/general education in their first two years, so numbers based on final major are more representative than first major, although for transfer students there is an insignificant difference. These numbers show that while a high percentage of our students graduate, it is taking them longer than we would like. It is our hope that the reduction in units for the undergraduate program – from 132 to 120 – will allow our students to graduate faster. From experience we believe that three main factors contribute to the length of time that it takes our students to graduate. First, many of our students work and thus must take reduced unit loads (not necessarily part time, but below the average 16 units/semester shown on our four-year plan). Second, many of our students come in unprepared to take Math 30 in their first semesters. Many need to take Math 19 Precalculus or remedial math or English courses, adding to their time to graduation. And third, quite a few students change major in the first year or two, particularly if they are doing poorly in Calculus. The 2nd Year (3rd Fall) Survival FTF Cohort data shown in Table 6. The higher graduation rates in this table indicate that much of our drop-off is in the first two years.

Table 6 Six-Year Graduation Rate for 2nd Year (3rd Fall) Survival FTF Cohort

<table>
<thead>
<tr>
<th></th>
<th>Fall 1999</th>
<th>Fall 2000</th>
<th>Fall 2001</th>
<th>Fall 2002</th>
<th>Fall 2003</th>
<th>Fall 2004</th>
<th>Fall 2005</th>
<th>Fall 2006</th>
<th>Fall 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Entering</td>
<td>27</td>
<td>25</td>
<td>29</td>
<td>26</td>
<td>41</td>
<td>47</td>
<td>16</td>
<td>36</td>
<td>47</td>
</tr>
<tr>
<td>Overall Rate</td>
<td>74.10%</td>
<td>64.00%</td>
<td>86.20%</td>
<td>80.80%</td>
<td>80.50%</td>
<td>89.40%</td>
<td>81.20%</td>
<td>80.60%</td>
<td>68.10%</td>
</tr>
</tbody>
</table>

Figure 1 illustrates our first-year retention rate over the course of sixteen years. It shows a modest improvement over time. This may be due to combination of factors, including impaction that has led to
better-prepared students, better advising, and the addition of the math and physics workshops that increase the passing rate.

![First Year Retention Rate, 1st Time Freshmen](image)

Figure 1 First Year Retention Rate

7. **Headcounts of program majors and new students (per program and degree)**

Tables 7, 8, and 9 provide the headcount of students in Fall 2013, the number of newly enrolled students from 2009-2013, and the headcount from 2009-2013.

<table>
<thead>
<tr>
<th>Degree</th>
<th>1st Fr.</th>
<th>UG Transf</th>
<th>New Creds</th>
<th>UGs</th>
<th>Creds</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>150</td>
<td>115</td>
<td>0</td>
<td>428</td>
<td>0</td>
<td>693</td>
</tr>
</tbody>
</table>

**Table 7 BSME Headcount Fall 2013**

<table>
<thead>
<tr>
<th></th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Time Freshman</td>
<td>75</td>
<td>57</td>
<td>95</td>
<td>31</td>
<td>150</td>
</tr>
<tr>
<td>New Undergrad Transfer</td>
<td>40</td>
<td>44</td>
<td>50</td>
<td>23</td>
<td>115</td>
</tr>
</tbody>
</table>

**Table 8 Newly Enrolled BSME Students**

<table>
<thead>
<tr>
<th></th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduates</td>
<td>595</td>
<td>583</td>
<td>605</td>
<td>525</td>
<td>693</td>
</tr>
</tbody>
</table>

**Table 9 Headcount of BSME Majors**

Tables 8 and 9 show an increase both in head-count and newly enrolled students over the years for the BS program. Fall 2012 numbers are lower due to a lower admittance and show rate, most likely partially due
to the announced impaction. The admittance rate for Fall 2013 was higher than normal, leading to a jump in numbers.

8. **SFR and average section size (per program)**

Table 10 shows the SFR and average headcount per section in ME courses in Fall 2013

<table>
<thead>
<tr>
<th>Course Prefix</th>
<th>Course Level</th>
<th>Student to Faculty Ratio (SFR)</th>
<th>Average Headcount per Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME - Mechanical Engineering</td>
<td>Total</td>
<td>26.3</td>
<td>39.7</td>
</tr>
<tr>
<td></td>
<td>Lower Division</td>
<td>23.8</td>
<td>88.0</td>
</tr>
<tr>
<td></td>
<td>Upper Division</td>
<td>27.8</td>
<td>40.8</td>
</tr>
<tr>
<td></td>
<td>Graduate Division</td>
<td>21.2</td>
<td>19.8</td>
</tr>
</tbody>
</table>

The average headcount for lower division ME courses is based only on ME 20 and 30. There is a very large 50-minute lecture for each of these classes followed by a smaller 2½ hour lab of about 25 students each later in the week. The 88.0 headcount must only be counting the lecture portion of the class.

These compare to the university’s SFR of 24.0 and College of Engineering’s SFR of 24.9 in Fall 2013. The average section size for the university and College of Engineering were 26.8 and 31.4. Our SFR is higher than the university average and our section size significantly higher. Increasing the number of full-time faculty would allow us to decrease both our SFR and our section size.

9. **Percentage of tenured/tenure-track instructional faculty (per department)**

<table>
<thead>
<tr>
<th>Mechanical Engineering</th>
<th>% Tenured/Prob</th>
<th>Tenured</th>
<th>Probationary</th>
<th>Temp Lecturer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>56.2%</td>
<td>6.448</td>
<td>5.023</td>
<td>0</td>
</tr>
</tbody>
</table>

**Part C**

10. **Closing the Loop/Recommended Actions**

a. **Coverage of Ethics (Outcome f) and Global/Societal Issues (Outcome h)**

Previous assessment data showed that our coverage of engineering ethics was barely acceptable. This conclusion is bolstered by the recent alumni surveys that show a lower level of satisfaction with PEO #4 than the others. To improve ethics coverage, this topic was moved out of ME 195a (where coverage was at a very low level on Bloom’s taxonomy), and a more in-depth module was added to each of the capstone design courses. See the discussion out Outcome f in Appendix A. This change has improved our coverage of this outcome. Additional improvement should be seen in Fall 2014. Engr 195a and b
combined with ME 195a and b have been approved to satisfy SJSU Studies areas S and V. Engr 195a covers global and social issues in engineering practice, including ethics. In the long run, we hope the addition of Engr 195a,b will increase the percentage of alumni who are satisfied or partially satisfied with PEO #4 (Our graduates are expected to determine and respond to ethical implications on issues such as public safety and intellectual property protection, and also reflect on global and societal impacts of engineering solutions to contemporary problems.). In our most recent survey that percentage of 70%. Adding Engr 195a, b should also improve our coverage of Outcome h (the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context).

b. Student achievement in ME 101 Dynamics

ME 101 Dynamics is a required junior-level course for ME, AE, and CE students. Poor achievement of the learning outcomes for this class can lead to failure in follow-on courses. In the latter half of the Spring 2014 semester we began work to provide early resources for students showing poor achievement to ensure that they learn the fundamentals necessary for success. Development of further resources will continue through the 2014-15 academic year. Work focuses on the development of online resources, improved strategies to present the material, and outside-class resources such as tutoring. If this work shows good results, it will be a model for other courses in the ME program. The extent of the work on this course will depend on the success of some grants proposals written by the ME faculty.

c. New/Improved Lab Facilities

The department is working on several new and improved lab facilities to make sure that equipment is up-to-date and to ensure coverage of important topics relevant to the Bay Area. These include an overhaul of the lab that goes with ME 190 Mechatronics Systems Design, spearheaded by Burfurd Furman, continuing development of the relatively new Renewable Energy Lab, directed by Jinny Rhee, and brand new facilities to study hybrid and electric vehicles as well as building energy efficiency, led by Fred Barez.

11. Assessment Data

Following the schedule presented in Section 4, since our last accreditation visit we have completed one round of assessment of SLO’s b, d, f, g, h, and j during the 2011-12 and 12-13 academic years. We are collecting data for the 2013-14 academic year to address SLO’s a, c, e, and i. Results are included in Appendix A. The tools used for assessment are given in Table 4. Additionally, we have performed one round of alumni surveys since our last visit, in Spring 2014. A Word version of the survey, which was administered electronically, is in Appendix B. A summary of survey results are given in Appendix C. Full results, including comments submitted by alumni, are available upon request.

12. Analysis

Most of the data for the 2013-14 academic year is not yet available, so the results of the 2012-13 year will be presented here. Full assessment results are presented in Appendix A. In the 2012-13 academic year,
results only showed the need for very minor improvements in the assessed outcomes. It is recommended that measures be taken to ensure that higher percentage of students turn in lab reports in ME 120 (Outcome b) and that an oral presentation for ME 195b be assessed to cover oral presentation (Outcome g). The results for ME 120 have just been sent to the instructor with recommended implementation in Fall 2014. Oral presentation evaluation in ME 195b should be covered in Spring 2014.

13. **Proposed changes and goals (if any)**

Per our assessment schedule presented in Section 4, we plan to assess outcomes k, f, j, b in the 2014-15 academic year. This will be the second round of assessment for f, j, and b since our last accreditation visit. We will be able to add assessment of ME 195a/ME 195b/Engr 195a/Engr 195b that were approved to cover SJSU Studies areas S and V to our assessment of Outcomes f and h.

A major goal for the 2014-15 academic year will be the hiring of new faculty. The mechanical engineering department offers 43 courses at the undergraduate level and 22 courses at the graduate level in addition to 14 teaching/student projects labs. It had 714 majors and 340 FTES in Fall 2013.

The last time a new tenure-track Mechanical Engineering faculty member was hired was 2002. In the last 12 years, it had a senior faculty member retire, and it also lost three tenured/tenure-track faculty when the AE program split from what used to be the MAE Department in Fall 2013. It has become increasingly difficult for the department to sustain its current activities in offering and coordinating all the aforementioned 65 courses, student advising and laboratory operations, with only 8.5 full-time faculty members in the department, particularly with the recent increases in enrollment. This has resulted in the large SFR and headcounts in ME courses shown in Table 10. The department would like to hire two tenure-track faculty members to begin in the 2015-16 academic year.
Appendix A  Outcome Assessment Fall 2011-Fall 2013

Outcome a Application of Math/Science/Engineering Fundamentals (Assessed Fall 2013 and continuing Spring 2014)

ME 113 Thermodynamics Assessment Data

For outcome 3a, we analyzed the following items

- Gateway quiz on the First Law of Thermodynamics (application of physics)
- Final exam question on mixtures (application of chemistry)
- Final exam grade (application of engineering principles)

In this course, students take a “gateway quiz” on the application of the First Law of Thermodynamics. Students must achieve a 70% or better to pass the class. The first quiz is given in class, and that score factors into their grade for the class. If they do not achieve a 70%, they have three opportunities to take different versions of the quiz online. While their scores on the online retakes do not factor into their overall grade for the class, they must achieve a 70% or better on one of the quizzes before they take the first midterm in order to pass the class. Fourteen students out of 60 scores lower than 70% on the first quiz, but all achieved a 70% or better upon retaking a different version of the quiz online.

The last question on the final exam in F13, worth 19% of the total points, related to properties of mixtures (application of chemistry). The average score on this problem was a 77% with 21% scoring below a C- on this question, showing room for improvement.

The final exam in ME 113 is cumulative and is a good indication of the ability of the students to apply the fundamentals of thermodynamics. It consists of theory questions from the Thermodynamics Concept Inventory developed by professors at several universities (approx. 20%), short questions related to environmental issues (approx. 8%) and the remainder consists calculation problems. Any student receiving a course grade of D+ or lower must retake the class. Of the students who achieved the course grade of C- or better, necessary to move on to ME 114 Heat Transfer, 88% received a C- or better on the final exam. The average grade on the final exam was a C+ with a median grade of B-. All of the students who passed ME 113 who had a final exam score lower than a C- ended up with a C- as their final grade. Better midterm exam, homework, and quiz scores allowed them to barely pass the course. Interestingly, the fail rate (D+ or lower) for this instructor for ME 113 over approximately six years has consistently been about 21%, but in Fall 2013 it was 13%. It may be that impaction has resulted in a stronger pool of students.

ME 113 alone is not sufficient to show achievement of Outcome a. Data from other courses are being assessed at the end of the Spring 2014 semester.

Outcome b Experiments (Assessed Spring 2013)

ME 120 Experimental Methods Assessment Data

For Outcome b, ME120 individual lab reports, individual oral presentation, and group project reports were used for assessment. For the project, students design their own experiment, set up a data acquisition system, and assess the results. The lab reports involve experimental setup, data acquisition, and data analysis.
Seventy-one students were enrolled in ME120 in Spring 2013. The scores from the project individual oral presentation ranged from 90 to 99% with average of 95%, showing excellent achievement.

Six lab reports were assessed for this outcome. Results are shown in Table A.1

<table>
<thead>
<tr>
<th>Lab Report #</th>
<th>Range of Scores (%)</th>
<th>Average (%)</th>
<th>Percent Scoring &lt; 75%</th>
<th>Percent Who Didn't Submit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>63-99</td>
<td>77.6</td>
<td>1.4</td>
<td>9.9</td>
</tr>
<tr>
<td>2</td>
<td>73-99</td>
<td>84.4</td>
<td>1.4</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>63-99</td>
<td>80.9</td>
<td>2.8</td>
<td>8.5</td>
</tr>
<tr>
<td>4</td>
<td>65-95</td>
<td>81.5</td>
<td>1.4</td>
<td>9.9</td>
</tr>
<tr>
<td>5</td>
<td>63-95</td>
<td>79.7</td>
<td>8.5</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>63-93</td>
<td>61.1</td>
<td>2.8</td>
<td>29.6</td>
</tr>
</tbody>
</table>

Students did not turn in their last lab report primarily due to lack of time because of other classes such as senior project which took priority at the end of the semester.

The maximum possible score for ME120 individual project report was 100. Scores from the project report ranged from 70 to 99 with average at 93.3. Two students (2.8%) were scored below 75%.

If lab report #6 is not taken into account, then ME120 lab reports, project report, and project oral presentation met Outcome b. However, it is recommended that stricter grading methods be employed to reduce the number of students who do not turn in lab reports.

Outcome f Professional and Ethical Responsibility  (Assessed Fall 2011)

In Fall 2011 coverage of ethics was moved from ME 195a to the capstone courses. Students choose to take ME 182, 157, or 190.

**ME 182 Thermal System Design**

The ethics assignment included an ethics case that included numerical calculations. The ethics case covered a nuclear safety issue where the degradation of a heat exchanger was to be analyzed. The Plant Nuclear Safety Review Committee was required to make a decision on shutting down the plant or maintaining operation while sand was causing a degradation in performance of two heat exchangers. The decision is up to a junior engineer to determine if the heat exchanger reduced flowrate (30% reduction) will allow hot side fluid temperatures to be maintained below 140°F and then provide her opinion to a quorum of seven more senior engineers. The chairman of the meeting would like to pass a JCO (Justification for Continued Operation) and states shutting down the plant will cost taxpayers money and a would like a quick decision and wants an open vote on the matter.

Several NSPE and ASME code of ethics are violated in this case. Students were first required to calculate the performance of the degraded heat exchangers to determine if the 30% reduction in flowrate has caused maximum temperatures to be surpassed. Also, students were required to answer four short answer questions including: 1) How the junior engineer should have voiced her opinion, 2) A discussion of how the chairman, and senior engineer, of the meeting should have acted to make a safe decision. 3) What should be the junior engineer's decision if there is a unanimous vote to keep the plant in operation. 4)
What are the flowrates that will allow for continued operation of the plant or require the shutdown of the plant. A quiz on the related codes of ethics was also administered.

Ninety-two percent of students who passed the course got a C- or better on this assignment. For the quiz, the percentage of students who got a C- or better was 86%. The average grade for the assignment 9.25/12 or 77%. The average grade for the quiz was 10.75/12 or 90%.

The instructor observed that the assignment worked well. In future semesters he decided to allow at least one more day to cover a few more ethics cases. Since the ethics portion of the class occurred near the end of the semester it was rushed a bit more than earlier assignments. For further improvement, the instructor recommended that he would have each student group, who answered questions on a particular ethics case, present their case's description, code violations, and proper way to prevent and resolve the ethics issue.

*ME 157 Mechanical Systems Design*

In the fall of 2011, the ASME Code of Ethics and the Code of Ethics for Engineers by National Society of Professional Engineers (NSPE) were reviewed. Several case studies were presented in the class for discussion. After the discussion in class, students were given a gateway assignment to review an engineering case related to public health and safety. Each student was required to submit one page typewritten summary to discuss the case and draw conclusion(s) on the engineer’s obligations in that case based on the given guidelines from the NSPE Code of Ethics.

All students in that class participated in this assignment and a minimum of 80% in earned score to be considered acceptable. From the ME157 class, the gateway assignment scores ranged from 80% to 100%. Out of 45 students, 13% got 8 out of 10 points in this assignment, 69% got 9 out of 10 points, and 18% got 10 out of 10 points.

*ME 190 Mechatronics Systems Design*

In this course, students were asked to read the National Society of Engineers: Ethics for Engineers and the ASME Code of Ethics of Engineers. Students were asked to answer 30 simple “yes” or “no” questions taken directly from the standards. 85% of students got 100% correct, and everyone had at least 85%.

Conclusions:

There was a range of coverage of ethics in the capstone courses. ME 157 showed acceptable coverage and performance. ME 182 went into much greater depth. 100% of students did not receive an acceptable score on the assignment, but this is to be expected with a much more challenging, in-depth assignment than the other sections received. The assignment provided in ME 190 was at too low of a level to be deemed acceptable. The instructor was asked to provide an assignment at a higher level on Bloom’s taxonomy, at least to the level of the ME 157 assignment, for Fall 2012. This was completed and will be reassessed in Fall 2014.

**Outcome g Communication (Assessed Fall 2012-Spring 2013)**

Engr 100W, ME115 and ME120 classes were used for the assessment.

*Engr 100W Engineering Reports*

To better meet the communication needs of industry and our students, the College of Engineering requires all students to take the ENGR 100W Writing Evaluation Exit Exam. Professional evaluators grade the E100W Writing Evaluation Exit Exams and assess the single-topic general essays based on features such
as organization, clarity, consistency of point of view, cohesiveness, appropriateness of diction and syntax, correctness of mechanics and usage, and content with appropriate details to support a thesis or illustrate ideas.

Scores are 0 – 12. The Exit Exam is worth 20% of the student's ENGR 100W grade.

Exit Exam (graded with 0 - 12)

A 11, 12
A- 10
B+ 9
B 8
C 7
F less than 7 (equals 0 for 20% of the ENGR100W course grade)

Assessment results of E100W Exit Exam in Spring 2013:
- 252 COE students enrolled
- 11 failed the Exit Exam earning less than 7/12 (4.4% of students enrolled)
- 5 received less than a C in 100W
- 2 Incompletes
- 1 WU

No separated scores were given for the ME students. However, since the failure rate is relatively low (4.4%), it can be assumed that the same failure rate can also be applied to the ME students.

*ME115 Thermal Engineering Lab*

The scores from two sections of ME115 lab reports were available for assessment. In each section, a total of five lab reports were used in this assessment. These are group lab reports, typically submitted by a team of three. There were 15 students enrolled in Section 3, and all lab report scores ranged from 80 to 100 points. 100% of the students in section 3 met the 3g Outcome. In Section 5, 11 students were enrolled in ME115. Out of 55 scores in Section 5, 4 were below 75% target mark.

*ME120 Experimental Methods*

Data showing student performance on ME 120 oral presentations and individual lab reports are included in under Outcome b. It is recommended that a grading rubric be used, with the oral presentation and written communication skills separated out so they can be assessed apart from the technical content.

Overall, Outcome g was met by ME115 lab reports, ME120 oral presentation and lab reports, and Engr 100W exit exam. It is recommended that an ME 195b presentation be assessed to augment oral presentation analysis.
**Outcome h Broad Education... Global, Economic, Environmental, and Societal Context.**

*(Assessed Spring 2013)*

Outcome h was assessed using ME113 written assignment on global impacts and contemporary issues of thermodynamics and ME195 group project reports.

*ME113 Global Impacts and Contemporary Issues of Thermodynamics Assignment*

The objectives of the ME113 assignment are to investigate some of the global impacts and contemporary issues that result from thermodynamic engineering solutions and to tie some of the theoretical concepts discussed in class to consequences and events that can affect us personally. This is an individual assignment with maximum possible score of 50. There were 45 students enrolled in ME113 in Spring 2013. The scores from this assignment ranged from 38 to 50 points with average at 44. All students achieved a minimum of 75% target score in this assignment.

In Fall 2013 the assignment was to write a researched advocacy memo in support of or against President’s Obama’s recommended significant increase in CAFE standards (Corporate Average Fuel Economy). This was set up as a gateway assignment. Any student who received below a C- had to revise and resubmit to pull up his or her grade to a minimum acceptable level.

*ME195 project report*

Each project group in ME195 required to include a detailed, well-documented literature review and discussion of environmental, societal, and/or economic impacts as part of the Chapter 1 contents. A maximum score of 8 was assigned to the Outcome h category. Scores from section 1 ranged from 4 to 8 with an average score of 6.8, section 2 ranged from 6 to 8 with average of 7.2, section 3 ranged from 7 to 8 with average of 7.5 and scores from section 4 ranged from 6 to 8 with average of 6.8.

Based on the results of ME 195 and ME 113, Outcome h is met. In Fall 2014, ME 195a and b were approved to satisfy SJSU Studies areas S and V when taken with Engr 195a and b. With these changes, Outcome h should be satisfied much more strongly than it is currently.

**Outcome 3i, Lifelong Learning (Assessed Fall 2011 and Spring 2014)**

This outcome is assessed using an ME 111 research project and a survey of graduating seniors that determines the extent of their learning activities outside of class assignments, such as involvement in student clubs or attendance at non-mandatory workshops.

*ME 111 Fluid Mechanics Research Project*

A mini-research project is assigned at the end of the course, asking students to research any application of fluid mechanics to a contemporary application. They work in groups of 3-5 comprised of mechanical and civil engineering majors. Requirements of the assignment include: finding relevant articles written within the past 10 years from the SJSU library databases and other sources, writing a joint technical research report describing the importance of the contemporary application and the role of fluid mechanics, and delivering an oral presentation to the class on their research project. The rubric used to grade the assignment was common to all three sections, and specifically assesses the targeted learning outcomes e, i, and j.

Each student on each project team was rated on their ability to engage in lifelong learning by demonstrating the retrieval of at least one archival quality publication, and by synthesizing, thinking
critically about, and evaluating the information contained within, again on a scale of 0 to 4. The data from section 4 are summarized below:

0/4: 0 (0%)
1/4: 4 (8%)
2/4: 22 (44%)
3/4: 7 (14%)
4/4: 18 (36%)

Based on this data, only 50% of the students received a score of 3/4 or better, and consequently, this outcome is not met.

Survey of Graduating Seniors

Graduating seniors taking ME 195b were surveyed to see how many were taking advantage of non-required learning opportunities outside of class. The following results were obtained.

45% were involved in an engineering-related student club during the 13-14 academic year.

22% participated in a national or regional design competition, such as those run by SAE, ASME, or ASHRAE, during the 13-14 academic year. Our students took first and second place in both the technical poster and oral competition at ASME’s regional competition held at Cal Poly SLO in April 2014. The first place winner in the oral competition will move on to nationals. ASHRAE and SAE teams had not competed yet at the time of the submission of this report.

32% attended non-required training/educational activities outside of class such as engineering seminars or short courses, during the 13-14 academic year.

70% had an internship or other job related to engineering while a student at SJSU.

20% worked on a research project with a professor.

While not all students are involved in these events, we are pleased with the high levels of participation in engineering clubs and competitions and that so many of our students avail themselves of the opportunities to expand their educations through a job related to their chosen career.

Outcome j Contemporary Issues (Assessed in 2011-12 academic year)

This outcome was assessed using an ME 111 research project, an ME 113 memo, and ME 113 exam questions.

ME 113 Thermodynamics memo

Students were required to write a 1-page researched memo advocating whether or not President Obama’s new CAFÉ standards should be adopted or not. This was a “Gateway” assignment – if students did not achieve an acceptable score (C- or better), they were required to revise it until they achieve acceptable results in order to pass the class. The number one reason for an initially failing grade was improper (or non-existent) referencing. After revisions, 100% of students received a C- or better, and the average was an 85%.
**ME 113 exam questions**

On the final exam, students were asked several questions related to contemporary issues. Students were asked what element in Freon caused problems for the ozone layer and if R-134a includes that element. 90% provided the correct answer to both, and another 5% knew the answer to only one of those questions.

Secondly, related to global warming, students were asked how greenhouse glass “traps” heat in a greenhouse. 83% could explain the physical phenomenon well, and another 7% had the right idea but did not explain it well. In the past students have shown a poor understanding of the idea behind the causes of global warming, so a question is placed on both a midterm exam and the final exam. Students always perform worse on this question on the midterm, and a similar question is put on the final to verify that their understanding has improved after additional reinforcement during lecture.

**ME 111 Fluid Mechanics Project**

The project described under Outcome i was used for assessment for this outcome as well.

The first assessment of these outcomes in this course using this project was performed in June of 2011 using data from all sections. In a follow up assessment, data was taken from S4 only. It is unclear how representative these results are of the project assigned in S2. Furthermore, a different project altogether was assigned in section 3.

Each student on each project team was also rated on their knowledge of contemporary issues, demonstrated by their written discussion of some impact fluid mechanics has had in an event or issue in the news in the past 10 years. Here, the rating is on a scale from 0-3. The data from all three sections is summarized below:

- 0/3: 0 (0%)
- 1/3: 0 (0%)
- 2/3: 4 (8%)
- 3/3: 46 (92%)

Based on the results of ME 113 and 111, this outcome is met. It is recommended that all sections of these courses use the same assignment to ensure that all students get coverage of all the outcomes.
Appendix B Alumni Survey  (Administered Electronically by IEA)

Greeting SJSU Mechanical Engineering Alumnus!

We hope that you will be willing to take a short survey about your education at SJSU. We have two reasons for sending out this survey. First, our accreditation agency requires us to have regular feedback from alumni. Second, and more importantly, we want your feedback about how to continually improve our program.

Part 1 Achievement of Program Educational Objectives

The first set of questions is used to show the accreditation agency how well we meet our program educational objectives.

**Program Educational Objective #1:** Produce graduates that within three years are employed as practicing engineers in their fields and applying engineering knowledge and skills to design components/systems, formulate, evaluate, and solve engineering problems

How satisfied are you that your education at SJSU prepared you to achieve this objective?

very satisfied, somewhat satisfied, neutral, somewhat dissatisfied, very dissatisfied

Are you currently employed in a field related to mechanical engineering or attending graduate school?

Are you currently employed in a field outside of mechanical engineering?

**Program Educational Objective #2:** Produce graduates that within three years are communicating effectively and performing professionally in both an individual and multi-disciplinary team-based project environment

How satisfied are you that your education at SJSU prepared you to achieve this objective?

very satisfied, somewhat satisfied, neutral, somewhat dissatisfied, very dissatisfied

Since graduating from SJSU, have you (check all that apply)

___ Contributed to company strategic decisions through your work and/or participation in team planning and execution
___ Applied effective listening skills in team interactions
___ Made an oral presentation to your coworkers/supervisors
___ Been a major contributor to a written report
___ Solved technical problems, including timely trouble shooting, product or process development
___ Motivated others toward a common goal
___ Presented alternative strategies to problem solving from others on the team in a non-confrontational way
___ Contributed to the professional development of one or more employees at your place of work through mentorship or peer-peer guidance.
___ Demonstrated your interest in the work of others at your place of employment by inquiring about their projects and plans

**Program Educational Objective #3:** Produce graduates that within three years have engaged and continue to engage in lifelong self-directed learning to maintain and enhance their professional skills

How satisfied are you that your education at SJSU prepared you to achieve this objective?
very satisfied, somewhat satisfied, neutral, somewhat dissatisfied, very dissatisfied

Since graduating from SJSU, have you (check all that apply):

___ Attended a graduate program or certificate program
___ Engaged in professional training through the workplace
___ Learned a new skill in the workplace
___ Joined (or kept membership in) a professional society, such as ASME
___ Passed the Fundamentals of Engineering Exam

**Program Educational Objective #4:** Produce graduates that within three years are considering ethical implications on issues such as public safety & intellectual property protection and societal & global impacts of engineering solutions to contemporary problems

How satisfied are you that your education at SJSU prepared you to achieve this objective?

very satisfied, somewhat satisfied, neutral, somewhat dissatisfied, very dissatisfied

Since graduating from SJSU, have you (check all that apply):

___ Contributed to a design or company decisions to improve health and safety
___ Contributed to a design or company decisions to improve impact on society or the environment
___ Followed standard engineering guidelines/practices in product design or development
___ Responded positively when faced with ethical choices in the workplace
___ Always respected individual and company intellectual property, including software licenses

**Part 2 Your feedback**

We want to hear about what you think to be our program strengths and weaknesses and where you would like to get involved in our program.

1. What are the strengths of the ME program at SJSU? What aspects of it really prepared you for the workforce?

2. Please discuss any topics or skills that you think should have been emphasized more during your studies at SJSU.

3. Please discuss any other areas for improvement.

4. Please rate how much you agree with this statement: Compared to my co-workers, I feel that my engineering education at San Jose State University prepared me well for my career.

   Completely agree, Partially agree, Neutral, Partially Disagree, Completely Disagree
5. Are you interested in sponsoring or advising senior design or master’s projects? Or being a guest speaker at a student club or class? If so, please let us know how you’d like to get involved and leave your name and contact information, and we’ll be in touch. Alternately, you can contact Associate Chair Nicole Okamoto at Nicole.okamoto@sjsu.edu or any other ME professor.

Thanks for your response! Please check out the SJSU ME alumni groups on Facebook and LinkedIn or at http://www.sjsu.edu/me/alumni/
Appendix C Alumni Survey Highlights  
Prepared by Institutional Effectiveness and Analytics – March 2014

In the February 2014, the Mechanical Engineering (ME) Department at San Jose State University conducted a survey of its graduates. The purpose of this survey is to collect feedback from alumni about the ME program at San Jose State University. This survey is part of the accreditation process for the ME department.

This online survey was developed and conducted by the ME Department in consultation with Institutional Effectiveness and Analytics. In February 2014, surveys were sent to 366 individuals, and a total of 64 responses were received. This is a 17% response rate.

Highlights/Selected Findings:

Program Educational Objective #1: Produce graduates that within three years are employed as practicing engineers in their fields and applying engineering knowledge and skills to design components/systems, formulate, evaluate, and solve engineering problems.
- 91% (57 out of 63) of the respondents are very satisfied or somewhat satisfied that SJSU prepared them to achieve program educational objective #1 (q1).
- 83% (53 out of 64) of the respondents are currently employed in a field related to mechanical engineering or attending graduate school (q2).

Program Educational Objective #2: Produce graduates that within three years are communicating effectively and performing professionally in both an individual and multi-disciplinary team-based project environment.
- 89% (57 out of 64) of the respondents are very satisfied or somewhat satisfied that SJSU prepared them to achieve program educational objective #2 (q4).
- 98% (62 out of 63) of the respondents solved technical problems, including timely trouble shooting, product or process development (q5_5).

Program Educational Objective #3: Produce graduates that within three years have engaged and continue to engage in lifelong self-directed learning to maintain and enhance their professional skills.
- 78% (50 out of 64) of the respondents are very satisfied or somewhat satisfied that SJSU prepared them to achieve program educational objective #3 (q6).
- 92% (58 out of 63) of the respondents learned a new skill in the work place (q7_3).

Program Educational Objective #4: Produce graduates that within three years are considering ethical implications on issues such as public safety & intellectual property protection and societal & global impacts of engineering solutions to contemporary problems.
- 69% (43 out of 62) of the respondents are very satisfied or somewhat satisfied that SJSU prepared them to achieve program educational objective #4 (q8).
- 83% (52 out of 63) responded positively when faced with ethical choices in the workplace (q9_4).

Overall
- 81% (50 out of 62) of the respondents completely or partially agree that their engineering education at SJSU prepared them well for their careers (q13).