Part A

1. List of Program Learning Outcomes (PLOs)
In the BSME program, we have both Program Education Objectives, which outline what we want our 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
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, at 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 the PEO’s, and we also receive feedback from our alumni through surveys administered every three 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.
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>
<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>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<td>✓</td>
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<td></td>
</tr>
<tr>
<td>PEO #4</td>
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<td></td>
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<td>✓</td>
</tr>
</tbody>
</table>

5. **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>
<thead>
<tr>
<th>University Learning Goals</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>
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<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>
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<tr>
<td>Applied Knowledge</td>
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<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>
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<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. **Alignment – Matrix of PLOs to Courses**

Table 3 shows where the BSME outcomes are covered and assessed, where H indicates 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. Appendix B contains catalog descriptions for the courses used for the current assessment cycle (Outcomes b, d, j, and k), as well as more detailed descriptions of the course formats and activities.

### Table 3: BSME Program – Outcome Matrix

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Student Learning Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>Engr 10</td>
<td>✓</td>
</tr>
<tr>
<td>Engr 100W</td>
<td></td>
</tr>
<tr>
<td>ME 101</td>
<td></td>
</tr>
<tr>
<td>ME 106</td>
<td>✓</td>
</tr>
<tr>
<td>ME 111</td>
<td>M</td>
</tr>
<tr>
<td>ME 113</td>
<td>M</td>
</tr>
<tr>
<td>ME 114</td>
<td>H</td>
</tr>
<tr>
<td>ME 115</td>
<td>✓</td>
</tr>
<tr>
<td>ME 120</td>
<td>M</td>
</tr>
<tr>
<td>ME 130</td>
<td>M</td>
</tr>
<tr>
<td>ME 154</td>
<td>✓</td>
</tr>
<tr>
<td>ME 195 A, B</td>
<td>✓</td>
</tr>
</tbody>
</table>

M: Medium contribution  H: High contribution  ✓ Skills relevant but not presently assessed

### Table 4: Assessment measures for each SLO

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

<table>
<thead>
<tr>
<th>Outcome 3d</th>
<th>Outcome 3e</th>
<th>Outcome 3f</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 106 term project reports</td>
<td>ME 111 homework assignment</td>
<td>Engr 10 homework assignments</td>
</tr>
<tr>
<td>ME 106 performance eval. forms</td>
<td>ME 106 term project, mini-project and lab exercises</td>
<td>Engr 10 final exam questions</td>
</tr>
<tr>
<td>ME 195 project topics</td>
<td>ME 154 project</td>
<td>ME 195 quiz</td>
</tr>
<tr>
<td>ME 195 performance evaluation forms</td>
<td></td>
<td>ME 195 group project reports</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome 3g</th>
<th>Outcome 3h</th>
<th>Outcome 3i</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 115 lab report</td>
<td>ME 113 papers</td>
<td># of students involved with clubs</td>
</tr>
<tr>
<td>ME 120 individual oral pres.</td>
<td>ME 195 group project reports</td>
<td># of student competition awards</td>
</tr>
<tr>
<td>ME 120 lab reports</td>
<td></td>
<td>ME 111 group project reports</td>
</tr>
<tr>
<td>Engr 100W exit exam</td>
<td>Engr 100W assignment</td>
<td></td>
</tr>
<tr>
<td>Engr 100W written assignments</td>
<td>student survey</td>
<td></td>
</tr>
<tr>
<td>ME 195 oral presentation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome 3j</th>
<th>Outcome 3k</th>
</tr>
</thead>
</table>
### 7. Planning – Assessment Schedule

BSME assessment operates on a 6-year schedule that calls for each SLO to be assessed during each ABET accreditation cycle. The schedule is shown in Table 5.

<table>
<thead>
<tr>
<th>ABET SLO</th>
<th>Year 1 2011-12</th>
<th>Year 2 2012-13</th>
<th>Year 3 2013-14</th>
<th>Year 4 2014-15</th>
<th>Year 5 2015-16</th>
<th>Year 6 2016-17</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>f</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>g</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>h</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>i</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>j</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>k</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

Within each outcome, ABET specifies several criteria, each of which should be individually assessed and met in order to fulfill the student outcomes. In summer 2015, assessment data from outcomes b, d, j, and k, from the 2014-15 academic year, were analyzed. We are collecting data for the 2015-16 academic year to address SLO’s a, f, g, and h, but those are limited at this time, so they are not reported here. The criteria for the 4 outcomes assessed in 2014-15 are listed in Appendix A, and those results are reported in Part B.

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, a grade of C- (70%) 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 to have 70% of students achieve an acceptable score (grade of C- or better). Over time, the 70% goal will be increased to work toward an ultimate objective of 100% students achieving an acceptable score.
8. **Student Experience**
   
   a. How are your PLOs and the ULGs communicated to students, e.g. websites, syllabi, promotional material, etc.?
   
   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 feedback from current students. The faculty have been recommended encouraged to add ABET learning outcomes to course syllabi.

   b. Do students have an opportunity to provide feedback regarding your PLOs and/or the assessment process? If so, please briefly elaborate.
   
   Since the PEOs represent the expectation of our graduates, they are assessed using surveys of alumni 3-5 years after graduation. A survey was closed on February 28, 2014 with 64 responses, and another survey will be sent out during the summer of 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 Council to receive feedback and recommendations for improvements from the employers of our graduates. The council most recently convened on April 25, 2016.
Part B
9. Assessment Data and Results

Outcome 3b: an ability to design and conduct experiments, analyze and interpret data

The assessment for Outcome 3b consists of 3 items:

1. ME 120 individual lab reports
   - Students worked in pairs to complete six directed experiments related to sensors, test and measurement instruments, and data acquisition hardware and software.
   - Students each individually wrote a lab report detailing the experimental goals, methods, results, conclusions.

2. ME 120 group term project reports
   - Students worked in teams to devise and carry out open-ended experiments.
   - Each team wrote a report documenting the experimental process and results.

3. ME 120 group term project oral presentations
   - Each team presented their project to the class.

Student Performance

1. ME 120 individual lab reports
   - Among students who turned in the reports and did not plagiarize, only one student earned a grade lower than 80% for the six lab reports.
   - The average score was 89%.

2. ME 120 group term project reports
   - No team earned a grade lower than 89% for the written project report.

3. ME 120 group term project oral presentations
   - No student earned a grade lower than 90% for the oral project presentations.

Outcome 3d: an ability to function on multi-disciplinary teams.

The assessment for Outcome 3d consists of 4 items:

1. ME 106 term project reports
   - Teams of 2-5 students completed term projects.
   - Students wrote group reports, which were graded and counted for a 20% of the course grade.

2. ME 106 performance evaluation forms
   - Each student evaluated his/her teammates’ individual performances on the term project.
   - Individual performance ratings were separate from the term project score and accounted for 10% of the course grade.

3. ME 195 project topics
   - Students in this terminal design class worked in groups to complete rigorous design projects.
   - Projects topics were selected based on their relevance and multidisciplinary nature.

4. ME 195 performance evaluation forms
   - Each student evaluated his/her teammates’ individual performances on the term project.
   - The forms used for this evaluation called for students to rate each team member’s performance in 10 areas on a scale of 1-5.
   - An example form is shown in Appendix C.

Student Performance

1. ME 106 term project reports
   - 100% of teams received scores of Acceptable or better on the overall project score.
The mean score was 4.47/5.0 (σ=1.13, N=36).

2. ME 106 performance evaluation forms
   - Only 8.3% of teams (3 of 36) acknowledged significant issues through the individual performance evaluations.
   - 2 teams experienced issues with inadequate effort or lack of follow through by one teammate.
   - 1 team had a disagreement surface toward the end of the semester and was unable to work out cooperation with one of the three team members. The remaining two members regrouped and finished the project successfully.

3. ME 195 project topics
   - Project titles and descriptions for one section are shown in Table 6.

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Shortened Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arc Jet Electrode Rebuild Workstation</td>
<td>Design, fabricate, and implement a safe, compact, automated machine with flexible adjustment capability to assist in the assembly and disassembly of an equipment or subsystem of multiple cathode and anode electrode packages for NASA Ames Arc Jet Facility.</td>
</tr>
<tr>
<td>Human Powered Vehicle</td>
<td>Design and build a human powered vehicle that can not only travel at speeds in excess of 25 mpg but can also handle the rough conditions experienced in the real world.</td>
</tr>
<tr>
<td>Leg Exercise Office Device</td>
<td>Design and construct exercise equipment that can be used in an office setting. The machine must allow the use to perform seated deskwork while in use, be electronically adjusted, and allow researchers to study its effect on cardiometabolic rates.</td>
</tr>
<tr>
<td>ASME Lighter Than Air Unmanned Air Vehicle</td>
<td>Design and build an unmanned aerial vehicle to be able to maneuver in the ASME competition. Must program and calibrate sensors and motors used in the UAV.</td>
</tr>
</tbody>
</table>

4. ME 195 performance evaluation forms
   - Only 2% of student scores on individual criteria were “Unacceptable” on the individual performance evaluations.

Outcome 3j: a knowledge of contemporary issues
The assessment for Outcome 3j consists of 4 items:

1. ME 111 group project reports
   - Students wrote a research based on contemporary literature related to fluid dynamics.
   - The paper accounted for 10% of the overall course grade.
   - A performance goal of 80% of students earning a grade of 70% or greater was set.

2. ME 113 exam questions
   - On the first exam, students were asked two short questions related to the cause of ozone depletion.

3. ME 113 papers
• After a lesson on global warming and ozone depletion, students were given a writing assignment on a current issue related to thermodynamics.
• In Spring 2015, this assignment was related to President Obama’s recommended increased CAFÉ Standards (Corporate Average Fuel Economy).
• Students individually wrote advocacy memos to members of congress either in support of or opposing the recommended CAFÉ Standards.
• Achieving a grade of 70% or better was required to pass the class.
• Students who did not achieve a passing grade were required to revise and resubmit.

4. Engr 100W assignments
   • Students complete various technical writing assignments.
   • Students must earn a grade of C or better to fulfill the Graduation Writing Assessment Requirement (GWAR).

Student Performance
1. ME 111 group project reports
   • 83% of students (119 of 144) who completed the assignment earned a grade of 70% or greater.
2. ME 113 exam questions
   • 86% of students answered questions about ozone depletion correctly.
3. ME 113 papers
   • The average grade on the first submission was 84%.
   • Only 4% of students earned a failing grade and were required to resubmit to pass the class.
   • All students earned a passing grade by the completion of the course.
4. Engr 100W assignments
   • Results from this assessment item are not available from the college at the time of this report.

Outcome 3k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
The assessment of Outcome 3k consisted of 7 items:
1. ME 106 individual lab reports
   • Students worked in pairs to complete 9 directed laboratory exercises related to electronic test and measurement instruments, electronic circuits and devices, sensors, actuators, microcontrollers, and embedded software.
   • Students each individually wrote a lab report detailing the experimental goals, methods, results, conclusions.
2. ME 113 assignment
   • This item was not assigned to students during the 2014-15 academic year, so criteria 3 (optimization) was not assessed during this period.
3. ME 154 assignment
   • One homework assignment required students to use modern software (such as an equation solver) to solve a linear system of equations.
4. ME 154 assembly drawings
   • Students completed semester-long design projects in teams of 3-4 students each.
   • CAD assembly drawings of their designs were collected and graded as part of the project milestones.
5. ME 154 group design report
   • Students completed a group design report at the conclusion of the semester.
6. ME 154 video
Students recorded, edited, and uploaded 3-minute videos showcasing their designs. These videos were shown in class in lieu of project presentations and were graded.

Student performance
1. ME 106 individual lab reports
   - A summary of scores for ME 106 lab reports is shown in Table 7.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Lab 1</th>
<th>Lab 2</th>
<th>Lab 3</th>
<th>Lab 4</th>
<th>Lab 5</th>
<th>Lab 6</th>
<th>Lab 7</th>
<th>Lab 8</th>
<th>Lab 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>avg=</td>
<td>37.10</td>
<td>37.94</td>
<td>37.58</td>
<td>38.19</td>
<td>37.99</td>
<td>38.51</td>
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<td>38.68</td>
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<tr>
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<td>2.84</td>
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<td>42.00</td>
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<tr>
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<td>29.00</td>
<td>21.00</td>
<td>30.00</td>
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<td>% at or above Acceptable =</td>
<td>100%</td>
<td>100%</td>
<td>99%</td>
<td>100%</td>
<td>97%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>97%</td>
</tr>
<tr>
<td># below Acceptable =</td>
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<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>% below Acceptable =</td>
<td>0%</td>
<td>0%</td>
<td>1%</td>
<td>0%</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>3%</td>
</tr>
</tbody>
</table>

2. ME 113 assignment
   - This item was not assigned to students during the 2014-15 academic year, so criteria 3 was not assessed during this period.
3. ME 154 assignment
   - 61% of students (64 of 105) achieved a score of 70% or greater on this assignment.
4. ME 154 assembly drawings
   - Student scores ranged from 85%-100%.
   - 100% of students achieved a score of 70% or greater.
5. ME 154 group design report
   - Student scores ranged from 81%-95%.
   - 100% of students achieved a score of 80% or greater.
6. ME 154 video
   - 100% of students successfully created, edited, and uploaded a video.
   - Student scores ranged from 82%-100%.
   - 100% of students achieved a score of 70% or greater.

10. Analysis

Outcome 3b: an ability to design and conduct experiments, analyze and interpret data
100% of students achieved an average grade of 70% or better (a passing grade) on all assessed items. Overall, most students earned a course grade of B or better in ME 120. Two students received grades of B-, primarily due to failing to turn in several lab reports each. Student performance on these assignments seems to support the conclusion that Outcome 3b is being met through ME 120 coursework.

Outcome 3d: an ability to function on multi-disciplinary teams.
1. ME 106 term project reports
   - 100% of students met the performance target.
2. ME 106 performance evaluation forms
   • 91.7% of teams (33 of 36) functioned without significant issues according to the
     individual performance evaluations, so the performance target was met.

3. ME 195 project topics
   • The design project topics reflect a multi-disciplinary approach and require students to
     synthesize material from disparate courses they have taken throughout their
     undergraduate studies.

4. ME 195 performance evaluation forms
   • Student evaluations indicated that this outcome was strongly met.

Overall, assessment indicated that students work well in teams, and truly non-functional groups are
rare. However, it is suspected that asking students to rate their teammates on a scale of 1-5 without
providing details as to what performance garners each rating is leading to incomplete information about
student performance. Recommendations for improving this are discussed in section 11.

Outcome 3j: a knowledge of contemporary issues
1. ME 111 group project reports
   • On aggregate, the performance target was met, indicating that students are able to
digest contemporary literature and connect it to their coursework.
   • There was some imbalance among the three sections, with the percentage of students
earning a passing grade ranging from 68% to 100%.

2. ME 113 exam questions
   • The performance target was met, demonstrating at least a very basic understanding of
how the chlorine in Freon caused problems for the ozone layer.

3. ME 113 papers
   • The performance target was met, indicating that students are able to develop and
express views on contemporary issues.

4. Engr 100W assignments
   • These results were not available from the college at the time of writing.

Overall, this outcome is fulfilled; however, some imbalance was noted in the ME 111 assignment from
section to section. Recommendations for rectifying this are noted in section 11. Results from Engr 100W
should also be examined, when available.

Outcome 3k: an ability to use the techniques, skills, and modern engineering tools necessary for
engineering practice
1. ME 106 individual lab reports
   • The performance target was met on this assignment, as nearly 100% of students
received an acceptable grade on each of nine lab reports.

2. ME 113 assignment
   • This item was not assigned to students during the 2014-15 academic year, so criteria 3
was not assessed during this period. It will be reinstated during the next assessment
period.

3. ME 154 assignment
   • The performance target was not met on this assignment, due to several factors.
   • First, this homework assignment was given during the 6th week of the semester, which
coincided with midterms in other classes and may have prevented students from giving
this assignment the necessary amount of time and attention.
   • Second, the lengthy process required to derive the correct coefficients for the linear
equations resulted in students making a variety of mistakes.

4. ME 154 assembly drawings
• The performance target was met for this assignment, indicating that students are proficient in using CAD software to create technical drawings.

5. ME 154 group design report
• The performance target was met for this assignment, indicating that students are able to create technical designs and present their results in writing.

6. ME 154 video
• The performance target was met for this assignment, indicating that students are capable of using modern equipment and software to create and edit videos.

Overall, student performance was very strong on items 1, 5, 6, and 7. However, item 2 was not assessed as planned, and students did not meet the performance goal for item 3. Assessment of item 2 will be re instituted during the next assessment period. As far as item 3, the course coordinator for ME 154 is aware of the scheduling conflict between this assessment item and midterms, and efforts will be made during the next assessment cycle to arrange the due date more favorably.

11. Proposed changes and goals (if any)
1. Assessment of ME 111 revealed inconsistencies among instructors in administration of the research project. Recommended actions include the following:
   a. Requiring all sections to dedicate same proportion of overall grade to the research paper,
   b. Developing and using uniform assignment instructions, and
   c. Developing and using a common grading rubric.

2. An ME faculty member recently attended an ABET workshop. Based on the lessons learned, the following improvements to the assessment process are recommended:
   a. Developing descriptive rubrics for use in grading of assessment items (i.e. when asking for a rating of 1-5, descriptions of what performance warrants each rating should be given),
   b. Streamlining the assignments being used for assessment to maximize coverage and minimize overlap, and
   c. Refine grading approaches in order to directly assess fulfillment of ABET criteria (see Appendix A).
Part C

<table>
<thead>
<tr>
<th>Proposed Changes and Goals</th>
<th>Status Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continued development of the Hybrid and Electrical Vehicles Lab</td>
<td>Prof. Barez continues to develop this laboratory. A brochure of its capabilities may be viewed at <a href="http://www.sjsu.edu/me/facultystaff/faculty/barez/">http://www.sjsu.edu/me/facultystaff/faculty/barez/</a> Hybrid_ElectricVehicleTech_Fullbrochure.pdf.</td>
</tr>
<tr>
<td>Development of new labs in the areas of controls and thermal-fluids</td>
<td>Profs. Bashash and Gosselin have each hired student researchers and have begun developing new labs. Of note, Prof. Gosselin supervised a senior design team in refurbishing a wind tunnel in E-141 and designing an experiment for possible future use in a computational fluid dynamics (CFD) course.</td>
</tr>
<tr>
<td>Potential expansion of ME 101 extra resources to ME 113</td>
<td>The ME 101 workshops continue to undergo development to optimize the impact on students. When those changes are complete, the workshops will be implemented in ME 113.</td>
</tr>
<tr>
<td>Investigation of low 6-year graduation rate</td>
<td>The College of Engineering continues to investigate the graduation rate.</td>
</tr>
</tbody>
</table>


Appendix A: ABET Criteria for Evaluation of Student Outcomes

Outcome 3b: an ability to design and conduct experiments, as well as to analyze and interpret data
ME graduates can:
1. Based on an identified problem, design an experiment to acquire data to solve a problem
2. Select appropriate equipment/instrumentation for an experiment to determine/measure the value of dependent variables from the given values of independent variables.
3. Calibrate the instruments from an experimental setup and follow procedures to collect data
4. Perform necessary calculations, error analysis, interpret data, and draw conclusions from a given set of data

Outcome 3d: an ability to function on multi-disciplinary teams
ME graduates can:
1. Participates fully in team, respects team members' opinions, resolves conflicts (if any)
2. Demonstrate team leadership by taking responsibility for various tasks, motivating others to reach project goals
3. Communicate ideas in ways that teammates can understand

Outcome 3j: a knowledge of contemporary issues
ME graduates can:
1. Give examples of contemporary issues related to Engineering and Technology, and articulate a problem statement or position statement for each.
2. Explain their relevancy to the present time.
3. Suggest reasonable/possible theories regarding the root causes of contemporary problems and identify possible solutions to contemporary problems

Outcome 3k: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
ME graduates can:
1. Use modern technology for engineering system design, control, and analysis.
2. Use contemporary software to write technical reports and give oral presentations.
3. Use computer simulations to conduct simple parametric studies and design/process optimization
4. Use modern equipment and instrumentation in their labs.
ME 106: Fundamentals of Mechatronics Engineering

Catalog Description
Foundational concepts in mechatronics including analog and digital electronics, sensors, actuators, microprocessors and microprocessor interfacing to electromechanical systems. Hands-on laboratory experiments with components and measurement equipment used in the design of mechatronic products.

Course Format and Activities
Students in ME 106 work in pairs to do the laboratory exercises, and teams of two to five to do the term project. For the laboratory exercises there is much give and take and mixing in terms of tasks (circuit construction, programming, and debugging). In the term project, there tends to be more compartmentalization by team members, but the project involves multiple disciplines such as mechanical design and fabrication, electrical design and fabrication, programming, testing, and documentation of the design. Some Electrical Engineering and Engineering Technology students take ME 106 and often are interspersed in lab and term projects.

Every student must evaluate his or her team mates in terms of their individual performance on the project. Following up recommendations from the spring 2010 ABET assessment, the individual performance ratings were separated from the term project score and made to stand alone as 10% of the course grade.

ME 111: Fluid Mechanics

Catalog Description

Course Format and Activities
The course used in the assessment is ME 111 Fluid Mechanics. ME 111 is a required undergraduate courses in the Mechanical Engineering program. In Spring 2015, three sections were offered and each was taught by a different instructor.

The outcome indicator examined here is performance in required coursework related to the outcome. Specifically, the ME 111 syllabus allocates at least 10% of the course grade to Research Paper that calls for digesting contemporary literature related to fluid mechanics and presenting by oral presentation to the class. The performance target applied to this assessment is as follows: “Scores earned by at least 80% of the students, in the particular assignments and tests questions, which pertain to this outcome, in each course where this outcome is measured, must be at least 70%.” The choice of 80% threshold for fraction of students was inherited from precedence from 2003 and 2007 for this same outcome. The choice of the 70% threshold for graded score assumes 70% is a conventional minimum for successfully completing a course with at least a “C-“ passing grade.

ME 113: Thermodynamics

Catalog Description
Course Format and Activities
ME 113 is a 4-credit required undergraduate course in Thermodynamics. A “gateway” writing assignment is given in ME 113 after a lecture on global warming and ozone depletion. In Spring 2015 this assignment related to President Obama’s recommended increased CAFÉ Standards (Corporate Average Fuel Economy). Students must write a researched advocacy memo to a congressman/woman or senator letting him or her know if they support the president’s increased fuel economy requirements. Students who score below a 70% must revise and resubmit their essays to achieve an acceptable score before they can pass the class (The best they can do after resubmission is a 70%). These students had to resubmit to pass the class. On the first exam, students are also given two short questions related to the cause of ozone depletion.

ME 115: Thermal Engineering Laboratory
Catalog Description
Thermodynamics and heat transfer experiments. Temperature, pressure, and flow rate measurements. Technical reports and presentations.

Course Format and Activities

ME 120: Experimental Methods
Catalog Description
Theory and practice of experimental methods and sensors for mechanical measurements; statistical and uncertainty analysis; computer-hosted data acquisition, processing and analysis; formal report writing and presentations.

Course Format and Activities
ME 120 has one 50 minute lecture and one three-hour laboratory session per week. There are six directed experiments that give students hands-on experience with various sensors, measurement instruments, and data acquisition hardware and software. Each directed experiment has a set of instructions that introduces the background of the experiment, the instruments, and the experimental procedure. The students work mostly in pairs to perform the experiments. Each student must individually write a report that describes what was done and what was learned.

In addition to the directed experiments, ME 120 has a term project where students work in teams to devise and carry out an open-ended experiment of their own. The team documents the experiment and their findings in a written report and presents it to their classmates in oral format using presentation software.

ME 154: Mechanical Engineering Design
Catalog Description

Course Format and Activities
A total of 105 students from two sections were enrolled in this course in Spring 2015. The two sections had the same homework assignments, project requirements, midterms and final exam. Students were divided into 32 design project teams. Four components from ME154 were evaluated for this
assessment, namely, project presentation video, CAD assembly drawings from design project, group design project report, and relevant homework assignment (HW#6 in this case).

A project report written using contemporary software such as Microsoft Word was required from each student project team, and each student received a project score from their instructor based on their individual cumulative contribution to their project throughout the semester. CAD assembly drawings from the student projects were collected and graded as part of the project milestone assignments. There were 12 homework sets assigned to students in the ME154 class. One of the homework assignments (HW #6) required students to use modern software (such as equation solver) to solve linear system of equations.

ME 195
Catalog Description
195A: First half of a one-year team project carried out under faculty supervision. Project will proceed from problem definition to analysis, design and validation, experimentation including possible construction and testing.
195B: Continuation of ME 195A. Culmination of project requiring a formal report consisting of documentation of project results and oral presentation.
Course Format and Activities
This is a terminal design class for mechanical engineering students. As such, we define multi-disciplinary teams to be members in the same team working on various sub-mechanical engineering disciplines such as: thermal/fluids, rigid-body dynamics, and mechatronics that include dynamics and control, sensors and actuators and electronics control circuit design, etc. There are projects that require synergistic integration of electromechanical systems, e.g., in vehicle design and prototype constructions, as well as mechanical/chemical interactions. In some cases, students work on teams with students from different department, such as on a large-scale project involving the design of an innovated automated transit network. There are also ME students who have joined Aerospace engineering majors in space-related projects and students who work on multi-disciplinary projects led by General Engineering that focus on assisting the community. Projects and student involvement vary from year to year. However, almost all projects are multidisciplinary within mechanical engineering according to our definition, and some include students from other majors/disciplines as well.

An individual performance evaluation was performed by the students at the end of the semester. Each student evaluated the performance of each team member in ten areas, as shown on the example form shown in Appendix C. Questions 3 and 5 relate to PEC 1, questions 1, 2, 7, and 8 to PEC 2, and question 10 to PEC 3.

Engr 100W
Catalog Description
Regular technical writing assignments and company-focused oral presentations while integrating effects of environmental factors as they relate to products, systems and engineering processes.

Course Format and Activities
Appendix C: Sample Performance Evaluation Form for ME 195

ME 195 Individual Performance Evaluation
(adapted from http://pr.ensu.edu/~whitten/classes/standards/team-eval.html,

Part of your semester grade will be based on your individual performance as evaluated by you and your team members. Using your best, objective and fair professional analysis, complete the following evaluation form concerning your and your team members' performance over the semester. For the questions below, rate yourself and your team members using this scale:

1 = poor (unacceptable performance)
2 = fair (marginally acceptable performance)
3 = average (acceptable performance)
4 = good (often exceeds acceptable performance)
5 = excellent (truly superior performance)

Your Name: 

1. QUALITY of work on the project: done correctly, clearly, completely, attention to detail, recommends innovative solutions, seeks to continually improve work
   5  2  5  5  5

2. QUANTITY of work on the project: delivered on responsibilities, worked efficiently and in an organized manner
   4  1  5  5  5

3. Level of COMMITMENT given to the project/team: attended all meetings, came on time, was prepared and ready to work, was dependable and reliable.
   4  1  5  5  4

4. Demonstration of JOB KNOWLEDGE: understanding of project goals and tasks required to reach goals, applied appropriate knowledge and skills to accomplish tasks
   5  2  5  5  5

5. Ability to COOPERATE: accepts guidance willingly, works constructively with others on the team, 'team player' rather than 'lone ranger'
   5  4  5  5  5

6. Demonstration of JUDGMENT: identified and analyzed problems, developed effective solutions, managed time effectively, effectively prioritized work tasks
   5  2  5  5  5

7. ATTITUDE toward work on the project: positive, encourages others, seeks consensus
   5  3  5  5  5

8. INITIATIVE taken on the project: proactive, does not wait to be told what to do
   4  1  5  5  5

9. ADAPABILITY: ability to handle changes to job assignment, schedule, work environment
   5  2  5  5  5

10. COMMUNICATION skill: clear oral and written communication
    5  3  5  5  5

Totals = 47 21 50 50 49

Average (divide total by 10) = 4.3 2.1 5 5 4.9

Additional Comments (use the back if necessary):

Team member 5: Name: [Redacted] Comments: gave great guidance throughout, with his industry experience.

Team member 4: Name: [Redacted] Comments: showed little effort throughout, but took on responsibilities very late in semester.

Team member 3: Name: [Redacted] Comments: well organized, needed no supervision and always delivered quality work.

Team member 2: Name: [Redacted] Comments: knowledge of CAD programs was good asset to team. Very enthusiastic about project.

Self - Comments: 

Signature of evaluator: [Signatures]

Date: 17-10-2010