PROGRAM PLANNING REPORT TEMPLATE
SAN JOSE STATE UNIVERSITY

Mechanical Engineering Department
MSME Program
College of Engineering
www.sjsu.edu/me

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<tbody>
<tr>
<td>External Reviewer (if known):</td>
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<tr>
<td>Date of Report:</td>
<td>December 14, 2018</td>
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<td>Date Due to PPC:</td>
<td>Fall 2018</td>
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1. Department/Program Recommendations

The MSME action plan is outlined in detail in Section 5. To summarize, the action items fall into these general categories:

- The MSME curriculum will be revised to follow EO1071.
- We will revise our curriculum to give greater emphasis to simulation, computational problem solving, hands-on training in prototyping, and open-ended multidisciplinary projects.
- We will investigate and address the causes of our low graduation rates.
- We will make curricular changes to give students better training on project planning and technical report writing.

The BSME action plan is outlined in Appendix C Section 8.

2. Progress on Previous Action Plan

The previous program plan, dated October 14, 2014, is outlined below along with our progress on said plan.

1. Develop guidelines for the comprehensive exam option for the graduate degree program to address:
   a. The number of times the exam can be taken prior to disqualification.
   b. Why students are not successful on the exam the first time. Failure rates report that 10 out of 12 students fail the first time.
   c. Place this information on the department website

Progress: Our assessment showed that students who took the comprehensive exam instead of two MS project or thesis classes did not make sufficient progress towards meeting our fifth program educational objective: Ability to think and work independently to perform design and in-depth analysis in solving open-ended mechanical engineering problems. As a result, we eliminated the comprehensive exam as an option.

2. Develop a plan for the graduate program to ensure sustainable and balanced admissions to the various areas of ME.

Progress: This continues to be an issue we are dealing with. With the elimination of the comprehensive exam, we needed sufficient faculty to supervise MS projects and theses. We
have just reached the number of faculty needed to slowly increase enrollment in MSME program. As a first step in this regard, the department chair is working with CIES to recruit about 20 additional international students. Nationwide, applications from international students are down, which may counteract our efforts in this area.

3. Update the department website with current information for students by cleaning up redundant information and correct/add thesis project guidelines. Ensure that the website is maintained.

Progress: The ME Graduate Studies Committee is paying much closer attention to the website, and the department chair has taken over updating this website for the time being to make sure everything is current. Redundant and out of date information has been removed, and more links to university sites (mostly GAPE) have been added rather than placing information directly on our site, which may lead to out-of-date information being posted.

We have just trained one of our student assistants on the website, and he is working with our Graduate Studies Committee to reorganize our site for MSME students.

4. Work with the Dean of Engineering to hire additional fulltime faculty in needed areas.

Progress: Since Fall 2014 when this action plan was developed, we hired six new faculty.

Dr. Feruza Amirkulova  specialty: acoustics and vibrations  joined Fall 2018
Dr. Amir Armani  specialty: mechanical system design  joined Fall 2018
Dr. Saied Bashash  specialty: mechatronics and controls  joined Fall 2015
Dr. Kathryn Gosselin  specialty: thermal/fluids  joined Fall 2015
Dr. Crystal Han  specialty: thermal/fluids, microfluidics  joined Spring 2018
Dr. Vimal Viswanathan  specialty: product design  joined Fall 2016

Dr. Gosselin left after the Spring 2018 semester, but we have been approved to hire in her area for Fall 2019. Dr. Fred Barez also moved 80% to Aviation and Technology. Dr. Amirkulova was hired in a similar area of expertise.
3. Program Descriptions

3.1 Program Mission and Goals

The ME Department mission is:

To serve society, the public sector, and private industry by:

- Providing undergraduate and graduate mechanical engineering education that prepares students with the knowledge, modern applications, and lifelong learning skills required to serve the engineering profession and industry.
- Contributing to the development and application of knowledge through faculty scholarship
- Preparing students for the modern professional-practice environment

The program learning outcomes listed in section 6.1 were developed to be in line with the mission.

3.2 Summary of Degrees, Minors, Certificates and Service Courses

This program offers only one degree: the master of science in mechanical engineering (MSME). There are no minors, certificates, concentrations, service courses, or general education courses offered in conjunction with this program. This program includes 6 units of required lecture courses, 3 units of GWAR (which can be replaced with elective units if a student has a waiver), 6 units of project or thesis, and 15 units of electives. Of the 15 units of electives, 6 units may be undergraduate electives or courses from other departments, with approval from the graduate advisor.

The department just received details about how EO 1071 is to be implemented at the very end of October 2018. We have been informed that our “core” can include courses selected from a list, as long as those courses all satisfy the same Program Educational Objective and have an assessment element that uses a similar rubric. Our Graduate Studies Committee will work on this revision in Spring 2019, along with input from our Department Advisory Council, which will meet in February. Program changes will likely be submitted for review in Fall 2019.

4. External Factors, Trends, and Context

4.1 Changes in the External Environment

The external environment has been changing in a fast pace with globalization, high performance computing capability, and wireless communication. Especially, emerging technologies including autonomous vehicles, internet of things (IoT), and 3D printing are closely related to the field of mechanical engineering. According to a task force of the American Society
of Mechanical Engineers (ASME) in their published report ASME Vision 2030 [1], the field of mechanical engineering has been experiencing expansion of the discipline’s boundaries, increased professional and diversity expectations, and rapid technological innovation.

The U.S. Bureau of Labor Statistics (BLS) reinforces a predicted higher demand for training in computational and simulation-based engineering skills such as finite element analysis (FEA), computational fluid dynamics (CFD), and probabilistic simulation (e.g., Monte Carlo) [2]. Proficiency in simulation tools such as ANSYS, Abaqus, COMSOL, and Fluent, will be increasingly in demand in the engineering job market because it has direct impact on cost reduction in commercial product development. Another noteworthy change is the increasing need for communication skills in multidisciplinary teams. According to The State of Mechanical Engineering: Today and Beyond [3], an ASME conducted survey on 1200 mechanical engineers, one in five respondents cited communication and one in seven cited multidisciplinary skills as the most-needed professional skills for engineers to succeed in the future. What is needed to thrive in multidisciplinary environments reaches beyond traditional mechanical engineering proficiency to include skills such as business writing, technical writing, and oral presentation. A similar suggestion appears in ASME Vision 2030 [4]. These results correlate well with suggestions made from a survey of SJSU MSME alumni conducted in 2017. MSME alumni who are currently working as an engineer in various fields (aerospace, semiconductors, medical device, energy, etc.) consistently pointed out the needs for emphasis on computer simulation, hands-on experience on modern tools, and industry-related project/thesis.

Section 4.2 Changes in the Field
As explained in detail in Section 4.1, the expected changes in factors that affect career opportunities for SJSU mechanical engineering graduates include the following:

1. Increasing role of simulation
2. Trend toward ubiquitous do-it-yourself (DIY) prototyping and testing
3. Increasing need for multidisciplinary skills
4. Increasing need for computational data analysis

To accommodate anticipated future changes in mechanical engineering field, our MSME program will evolve to give greater attention to simulation and computational problem solving, offer hands-on training in prototyping, and diversify open-ended projects that include a higher fraction of multidisciplinary subjects (e.g., mechatronics, microfluidics, biotechnology, entrepreneurship). More specifically, the MSME program plans to offer computation and simulation courses on a regular basis.
Specific examples of how curriculum will evolve include the following

1. A course on Nonlinear and Adaptive Control has already been piloted under ME-296N. We plan to offer it more regularly as a permanent course. This course includes modeling, analysis, and control of nonlinear systems with significant numerical simulations in MATLAB and Simulink environments.

2. We plan to revamp Vibrations in Mechanical Systems course (ME243) to include hands-on MATLAB based mini-projects and homework. The overall educational objective of this course is to develop an understanding of theoretical foundation and analytical/simulation skills for vibration analysis in various engineering applications; understand the modeling and analysis of structural and system vibrations using classical techniques; gain skills of using numerical simulation analysis and design software such as MATLAB to solve practical modeling as seen in industry.

3. We intend to pilot a new course on Computational Solid Mechanics and Acoustics based on FEA and Boundary Element Methods. This course will be designed to teach problem-solving techniques for design and analysis of applied solid mechanics and engineering acoustics problems. The course will introduce computational techniques for the simulation of a large variety of engineered systems. The students will have hands-on computational experience using a commercial FEA software: COMSOL Multiphysics software and BEM based open source software, e.g. BEM++ (Python interface) or OpenBEM (MATLAB). The students will also implement simple MATLAB codes, interpret numerical results, use existing general-purpose programs, learn how to integrate COMSOL Multiphysics with MATLAB Scripting, and work on modeling mini-project addressing problems arising in engineered systems.

4. We have initiated 3D printed and Additive Manufacturing (ME268) course where students learn applications of fundamental technologies in 3D printing and additive processes in electronics, medical devices, aerospace, and vehicles. Emphasis will be on offering students hands-on experience in prototyping and testing.

5. We intend to revise our required course ME 230 Mechanical Engineering Analysis from focusing on primarily pen-and-paper mathematical analysis to a course that integrates numerical methods using such computational tools as Python or MATLAB.

4.3 Trends in Entering Student Characteristics
The demographic data within the last 5 years indicate a continuous rise in the number of admitted students to the Master program in Mechanical Engineering (from 40 in AY 2013-14 to 74 in AY 2017-18). The percentage of female students has increased from 10% in AY 2013-14 to 16% in AY 2017-18. Growth in the percentage of female students may be in part due to the
gender balance efforts by the department on hiring and COE efforts to attract more female students, such as running a popular Women in Engineering conference for Bay area schools. Data are shown in Figure 1, below.

California residents have constituted the majority of the student body (near 69%) followed by the international students (around 30%). Percentage of international students was steadily increased from 22% in AY 2013-14 to 45% in AY 2016-17, but dropped to 26% in AY 2017-18, following a national trend of fewer international applicants.

The ethnicity demographics indicate dominance of foreign (33%), Asian (27%), and white (20%) ethnicities. With the drop in the percentage of foreign students in AY 2017-18, Asian has become the dominant ethnicity. The percentage of Hispanic students has dropped from nearly 12% in AY 2013-14 to near 4% in AY 2017-18.

The recent growth in the number of admitted students will require offering the graduate courses more frequently, teaching more advanced courses, and hiring more faculty members to teach new courses and supervise student projects and theses. The department faculty will continue to grow in accordance with the student growth in the coming years. Additionally, the increased release time opportunities for research in recent years offered by the college and now the university will result in the need for more full-time faculty to contribute to the program.

References
[4] https://doi.org/10.1109/FIE.2011.6143065

5. Strategic Direction for the Program(s)

This section describes our plan of action, which comes as a result of EO1071 requirements, challenges described in Section 4, and assessment results described in Section 6. For each element, a specific plan of action is proposed along with a tentative timeline and resources required.

5.1 Changes to the curriculum and delivery of the program(s)

   a) As mentioned in Section 3.2, we will be developing a larger “core” to be in line with EO1071. Tasks include the following:
o Discuss and research an implementation plan as faculty with input from Department Advisory Council, Spring 2019

o Submit proposed changes to curriculum, Fall 2019.

b) As mentioned in Section 4.2, simulation and computational problem solving along with prototyping have become increasingly important for the ME field. Planned curricular changes are outlined in Section 4.2. As mentioned in the BSME action plan, we also hope to add workshops and/or classes that focus on skills such as finite element analysis, computer aided design, and geometric dimensioning and tolerancing. Those workshops would be open to both graduate and undergraduate students. Timeline of action plan:

o More frequent offering of ME 296N – ongoing. Dr. Bashash teaches this course. In Spring 2019 we will submit paperwork to turn this into a permanent course.

o ME 243 revamp: Spring 2019, Fall 2020, Spring 2022. Dr. Amirkulova, a new tenure-track faculty member, will lead this effort.

o New course on Computational Solid Mechanics and Acoustics: first offering likely in 2022. Dr. Amirkulova will lead this effort.

o ME 268 3D Printing and Additive Manufacturing: We are tentatively planning to offer that class for the first time in Spring 2019, pending recruitment of a part-
time faculty member. In future years we plan for Dr. Armani, one of our new
tenure-track faculty members, to teach this class. Dr. Armani will recommend if
ME 268 should be converted to a lecture/lab course, in conjunction with our
department Graduate Studies Committee.

- Resources will be required to develop 3D printing facilities that would be
used both for this class and for other student projects. We have two
existing 3D printers in our department (one being quite small). Dr. Armani
is currently setting up a research lab that includes 3D printing capabilities
as part of his start-up funds. Additional resources will be needed to
expand fabrication abilities, not only for this class but also for other
student projects. And student use will require staff supervision. It may be
possible for the college to develop joint 3D printing facilities that would
be used by several departments. The ME Department will be approaching
the COE Dean’s Office to discuss. For further discussion on the topic of
fabrication facilities, see the BSME program planning report, Section 6
challenge #3.

- The target for integration of the lab with the course is set for 2021.

  - ME 230 curriculum change: This course has been taught by our part-time lecturer
    Dr. Shabany for many years, but our new tenure-track faculty member Dr.
    Amirkulova has excellent expertise in this area. She will be busy for some with the
    updates to ME 243 and the new computation solid mechanics course. We may
    need to support training for Dr. Shabany in Summer and/or Fall 2019 with a
    course revamp, assisted by Dr. Amirkulova, set for gradual implementation from
    Spring 2020-Spring 2021.

  - Workshops/courses on software and practical skills.
    - Spring 2019: The ME Department will develop a policy on workload and
      compensation for workshops.
    - Spring 2019: We plan to offer SOLIDWORKS Professional certification
      (solid modelling CAD software) through an independent study course. This
course will not count as an elective but will provide a good skill set to
    graduates.
    - Fall 2019: A new course, ME 100 Mechanical Engineering Career
      Development, has just been approved and will be available to all our
      students. In addition to providing career guidance, students will learn how
to advertise themselves and compete in the job market.
    - 2020-2023: Workshops may be developed to cover topics such as finite
      element analysis, geometric dimensioning and tolerancing, and advanced
simulation skills.

5.2 Faculty Recruitment and Development

We are currently recruiting a new faculty member in the thermal-fluids area. To keep in line with the increased use of simulation in the field, we have expressed a preference for a candidate with background in computational fluid dynamics.

We expect some retirements in our department in the next six-year cycle which will result in the need for more hiring. If we see a growth in MSME enrollment of 20% or more, we will need to increase the headcount of tenured/tenure-track faculty so that we have a sufficient number to supervise the MSME projects and theses. If not, our current head-count is sufficient for the time being.

For future hires, we would give preference to candidates with a multidisciplinary background (such as mechatronics and smart technology) or who have fabrication skills (such as 3-D printing) or simulation skills (finite element analysis, computational fluid dynamics, solid modelling tools, etc.). While we see the increased importance of simulation, as a program that prides itself on the hands-on skills that our students achieve, we will not neglect the importance of experimental researchers a well as those with backgrounds in simulation. For future hires, the area of hiring will align with areas of growth in the department.

5.3 Department Initiatives to Enhance Student Success

The department is planning activities around three central areas to improve our MSME student success.

b) The department will attempt to determine the cause of our low graduation rate and propose solutions. This low graduation rate is discussed in Section 7.1. Action plan and timeline:

1. Department Graduate Studies Committee to examine list of courses taken by new MSME students with undergraduate degrees other than ME to see if the list can be reduced, Spring 2019.
2. Department analyst to track students who dropped out of the program and contact them to determine the reasons for their leaving, Summer and Fall 2019. Student data and contact information available in the new Student Data Warehouse will make this process much easier than it previously would have been.
3. Department to propose action plan to address dropout rate, Spring 2020.
Implementation to follow in 2020 to 2022.

b) As discussed in Section 6.4, our students’ communication skills, as exhibited by their MS project reports and theses, tend to be worse than their technical skills. To combat this problem, we have a new GWAR course that was just approved in November 2018 for implementation in Fall 2019. ME 201 Project Planning will have a much greater focus on topics such as literature searches and development of formal objective statements than our current GWAR course ME 265.

The assessment in Section 6.4 shows that our student performance on MS projects and theses improved significantly once we required a detailed proposal before students could add the relevant courses. We hope that having this entire course devoted to project planning will help students develop the skills they need to plan and carry out projects more effectively, whether they be their MS projects/theses or projects for their work after graduation.

c) The department realizes that there are opportunities for us to increase our industry involvement, particularly in the area of industry-sponsored MS projects and theses. Those projects can have multiple benefits – they help faculty stay current in their fields, give students the opportunity to work on a difficult, practical project to apply their learning, and help place students in jobs after graduation. Our action item is for the department to discuss and develop a plan to increase this industry involvement in our MS projects and theses.

One way that we continue to be involved with industry is through the off-site MS program that we run at Lockheed Martin. The first cohort of students is graduating in Spring 2019, and we plan to offer a second cohort starting in Fall 2019 if there is sufficient interest. Advertising will begin in Spring 2019.

5.4 Staff and Resource Implications

a) The heavy focus on simulation requires a modern, high-power computer lab. Since the university abandoned the lab-refresh program, we need the resources to keep our computers lab (ENG 213/215) up to date. Last spring we were given a quote $60,000 to update our computers to the minimum requirements to run our software, but we do not have those kinds of resources available. The university recently signed a contract with CDW for Desktop as a Service, which effectively puts all of our software applications in the cloud. We are hopeful that this contract will solve our computing needs problem.
This solution may be effective as early as the Spring 2019 semester.

b) As mentioned in Section 5.1.b, if we wish to teach our students prototyping skills, we need dedicated resources to fund high-end prototyping equipment. A college-level prototyping lab open to students from multiple departments is a potential solution. The new College of Engineering Maker Space could serve as a model. Expansion of prototyping equipment would require training for technicians and dedicated technician time to oversee. Additional discussion is given in the BSME Program Planning Report, Section 6, Challenge #3.

During our recent ABET visit, we initially were given a weakness because of the age of our equipment. While the department has funds provided for labs, most of those funds are used to hire TA’s, leaving little left over for regular upgrades. New large equipment purchases could be even harder to finance. The College of Engineering provided funds to upgrade our mechanical measurements and mechatronics labs in Spring 2018, which resulted in the removal of the weakness by ABET. The COE dean’s office has promised to provide funds for TA’s in the future so that more of our lab funds can be used for purchasing equipment. However, we do not yet have a budget for the 18-19 academic year, so it’s unclear how this will work out.

c) 21st century education requires modern lab space. A number of our labs are very old and dilapidated, and some do not follow proper electrical codes and standards. We do not have the resources for things like re-doing electrical work, replacing plywood floors, or replacing dilapidated cabinets. Additionally, if we expand our faculty further, we also will have trouble finding office space. Further discussion of these items, along with a potential solution to our office space issue, is given in the BSME Program Planning Report, Section 6, Challenge #2.

6. Assessment of Student Learning in the Program

6.1 Program Learning Objectives (PLO)

The program educational objectives of the MSME program are that our graduates would develop the following:

1. A strong foundation beyond the undergraduate level in their chosen focus area as well as in mathematics, basic science and engineering fundamentals, to successfully compete
for technical engineering positions in the local, national and global engineering market, advance in their current position or pursue doctoral studies.

2. Professional and lifelong learning skills to be able to apply and extend theory to solve practical contemporary engineering problems.

3. The expertise necessary to design mechanical engineering systems with possible specialization in areas such as energy systems, electronics cooling, electronics packaging & reliability, finite element analysis & CAD, mechatronics & MEMS, product design, robotics, automation & manufacturing.

4. Strong verbal and written communication skills, including the ability to read, write and comprehend technical documents.

5. Ability to think and work independently to perform design and in-depth analysis in solving open-ended mechanical engineering problems.

6.2 Map of PLOs to University Learning Goals (ULG)

Table 1 Map of Program Learning Outcomes to University Learning Goals

<table>
<thead>
<tr>
<th>University Learning Goal</th>
<th>PLO1</th>
<th>PLO2</th>
<th>PLO3</th>
<th>PLO4</th>
<th>PLO5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized Knowledge</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broad Integrative Knowledge</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intellectual Skills</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Applied Knowledge</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Social and Global</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Responsibilities</td>
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6.3 Matrix of Courses to PLOs

Students are introduced to topics related to the program learning outcomes in their undergraduate programs. If they join the MSME program with an undergraduate degree other than mechanical engineering, they are admitted conditionally and required to take certain undergraduate courses to provide that introduction.

Classes where those skills are reinforced are shown in Table 2 with an “R”, and mastery is shown with an “M”.

6.4 Interpretation of Assessment Results and Subsequent Actions

Program assessment is completed using three classes. ME 230 covers PEO 1, and the two ME project/thesis classes are uses to assess the remaining outcomes.
Table 2 Coverage of Program Learning Outcomes in MSME Courses

<table>
<thead>
<tr>
<th>Program Learning Outcome</th>
<th>ME 230</th>
<th>ME 273</th>
<th>ME 265 (GWAR)</th>
<th>Electives</th>
<th>ME 295/299 (project/thesis)</th>
</tr>
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<tbody>
<tr>
<td>1. Technical Foundation</td>
<td>R</td>
<td>M</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>2. Lifelong Learning Skills</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>M</td>
</tr>
<tr>
<td>3. Specialized Expertise</td>
<td>R</td>
<td>R</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>4. Communication Skills</td>
<td></td>
<td></td>
<td>R</td>
<td></td>
<td>M</td>
</tr>
<tr>
<td>5. Independence in Discipline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>M</td>
</tr>
</tbody>
</table>

For PEO 1, the final exam for ME 230 was used for assessment purposes since it’s cumulative and covers only questions related to the background technical foundation of the students. Results are shown in the table below. Final exam grades of “A” or “A-“ were considered to be exceeding expectations with grades of “C” though “B+” considered meeting expectations. Assessment with this course was added relatively recently, so we do not have data going back all the way to the last program planning meeting. Results show relatively strong achievement of this outcome.

Table 3 Assessment of PEO 1 through ME 230

<table>
<thead>
<tr>
<th></th>
<th>% exceeds expectations</th>
<th>% meets</th>
<th>% does not meet</th>
</tr>
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<tbody>
<tr>
<td>Spring 2018</td>
<td>48</td>
<td>43</td>
<td>9</td>
</tr>
<tr>
<td>Fall 2017</td>
<td>44</td>
<td>49</td>
<td>7</td>
</tr>
<tr>
<td>Spring 2017</td>
<td>53</td>
<td>42</td>
<td>5</td>
</tr>
<tr>
<td>Fall 2017</td>
<td>38</td>
<td>49</td>
<td>13</td>
</tr>
</tbody>
</table>

Results indicate that a large majority of students are meeting or exceeding expectations for PEO 1.

The remaining outcomes are assessed using a rubric applied to MS project/thesis reports and presentations. The rubric is shown in Appendix A. Average results are shown in Table 4. Rubric elements are tied to PEO’s as shown:
Results show that the weakest of the areas on average are “Math and Computations” and “Writing”. Perhaps a clearer picture is to look at the percentage of students who do not meet expectations for each element. For these classes (ME 295a/b, ME 299), not meeting expectations was chosen to be a value of lower than 3.0 on a 4.0 scale, since anything lower than a B on an MS project or thesis really is not acceptable. Results are shown in Table 5.

### Table 4 MS Project/Thesis Average Performance Results

<table>
<thead>
<tr>
<th></th>
<th>Motivation/ Objectives</th>
<th>Literature Review</th>
<th>Analysis &amp; Assumptions</th>
<th>Math &amp; Computations</th>
<th>Engr Principles</th>
<th>Modern Tools</th>
<th>Presentation of Results</th>
<th>Writing</th>
<th>Summary &amp; Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2012</td>
<td>3.52</td>
<td>3.04</td>
<td>3.12</td>
<td>2.88</td>
<td>3.20</td>
<td>3.52</td>
<td>3.28</td>
<td>3.04</td>
<td>3.20</td>
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<tr>
<td>Spring 2013</td>
<td>3.60</td>
<td>3.44</td>
<td>3.20</td>
<td>3.12</td>
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<td>3.60</td>
<td>3.28</td>
<td>3.20</td>
<td>3.36</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>3.36</td>
<td>3.28</td>
<td>2.96</td>
<td>2.88</td>
<td>3.04</td>
<td>3.52</td>
<td>3.12</td>
<td>3.12</td>
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</tr>
<tr>
<td>Fall 2015</td>
<td>2.72</td>
<td>2.80</td>
<td>2.72</td>
<td>2.80</td>
<td>2.88</td>
<td>2.96</td>
<td>2.56</td>
<td>2.40</td>
<td>2.72</td>
</tr>
<tr>
<td>Fall 2016</td>
<td>3.44</td>
<td>3.36</td>
<td>3.20</td>
<td>2.80</td>
<td>3.28</td>
<td>3.52</td>
<td>2.96</td>
<td>2.96</td>
<td>3.12</td>
</tr>
<tr>
<td>Spring 2017</td>
<td>3.68</td>
<td>3.36</td>
<td>3.20</td>
<td>3.12</td>
<td>3.36</td>
<td>3.68</td>
<td>3.28</td>
<td>3.36</td>
<td>3.28</td>
</tr>
<tr>
<td>Fall 2017</td>
<td>3.36</td>
<td>3.20</td>
<td>3.04</td>
<td>2.96</td>
<td>3.04</td>
<td>3.44</td>
<td>3.04</td>
<td>3.12</td>
<td>3.04</td>
</tr>
<tr>
<td>Spring 2018</td>
<td>3.70</td>
<td>3.50</td>
<td>3.60</td>
<td>3.50</td>
<td>3.60</td>
<td>3.80</td>
<td>3.50</td>
<td>3.50</td>
<td>3.50</td>
</tr>
<tr>
<td>Average:</td>
<td>3.42</td>
<td>3.25</td>
<td>3.13</td>
<td>3.01</td>
<td>3.21</td>
<td>3.51</td>
<td>3.13</td>
<td>3.09</td>
<td>3.17</td>
</tr>
<tr>
<td>St Dev:</td>
<td>0.31</td>
<td>0.23</td>
<td>0.25</td>
<td>0.24</td>
<td>0.22</td>
<td>0.25</td>
<td>0.28</td>
<td>0.33</td>
<td>0.23</td>
</tr>
</tbody>
</table>

### Table 5 Percentage of Students Scoring “Below Expectations” on MS Project/Thesis Assessment Forms

<table>
<thead>
<tr>
<th></th>
<th>Motivation/ Objectives</th>
<th>Literature Review</th>
<th>Analysis &amp; Assumptions</th>
<th>Math &amp; Computations</th>
<th>Engr Principles</th>
<th>Modern Tools</th>
<th>Presentation of Results</th>
<th>Writing</th>
<th>Summary &amp; Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2012</td>
<td>11</td>
<td>38</td>
<td>45</td>
<td>59</td>
<td>38</td>
<td>18</td>
<td>34</td>
<td>45</td>
<td>32</td>
</tr>
<tr>
<td>Spring 2018</td>
<td>2.9</td>
<td>12</td>
<td>5.9</td>
<td>11.8</td>
<td>2.9</td>
<td>0</td>
<td>12</td>
<td>12</td>
<td>6</td>
</tr>
</tbody>
</table>
A number of factors have led to improved scores.

1) The department in recent years has established a process by which students develop a thorough proposal, including sections related to background, literature review (with at least 10 sources), objective, methodology, and timeline. This proposal must be approved by three committee members, the graduate advisor, and the department chair before they can add the first project/thesis class. This requirement has resulted in significant improvements in student performance. In the past, students spent as much as the first half of the first semester developing a good project plan. The faculty believes that this a major cause of improvements in scores.

2) The department now has a better spread of projects among faculty members, with no faculty member too over-burdened with too many projects.

3) The grading rubric for the Spring 2018 results is now directly tied to student grades. While student performance has undoubtedly improved, committee members are now more thoughtful about what scores they give, which led to evaluators assigning higher scores. So in some ways the comparison from 2012 to 2018 is not even-handed.

Examining Table 5, we can see that three of the four areas with higher rates of failure are directly related to communication – Literature Review, Presentation of Results, and Writing. Our new GWAR course ME 201 mentioned earlier should result in improvements in those areas, especially with the literature review. The syllabus of that course is shown in Appendix B.

The remaining area is “Math and Computations”. Some projects are mathematically intensive whereas in others it isn’t as clear how best to apply computations. The department Graduate Studies Committee is currently discussing ways to improve this section of theses/project reports.

6.5 Longer Term Indicators of Student Success

A 2017 MSME alumni survey with 52 respondents indicated that a large majority were working in the field of engineering. Fields of work include aerospace, appliance, automotive, computer hardware, consumer electronics, energy, HVAC, lasers, medical devices, semiconductors, and many more. Only 6% listed fields of employment outside of engineering (1 each in banking and retail and one medical doctor). A large majority had titles such as design engineer, senior mechanical engineer, chief engineer, or project manager.
7. Program Metrics and Required Data

7.1 Enrollment, Retention, and Graduation Rates
The 4-year graduation rate for our transfer students for Fall 2013 graduates (the most recent semester with data available), was 59%. This is significantly below the College of Engineering average of 83% and SJSU average of 79%. Two-year rates show even more disparity, with 29% for ME compared to 70% for the COE and 54% for SJSU in Fall 2015.

This low graduation rate bears examination. One of the action items for the future is to perform more detailed analysis of the causes and potential solutions for this low rate. One area to examine is conditional and/or provisional admittance. For Fall 2018, 38% of students were admitted conditionally or conditionally/provisionally, and 20% had an undergraduate major other than ME. Those with undergraduate majors other than ME must take undergraduate courses before starting their graduate coursework. The list can be six classes or more. This adds time to graduation and makes it more likely that those students will drop out. We need to re-examine the list of courses to make sure that only the minimum needed for success are required. Too many extra courses will add significantly to graduation or discourage students from completing their coursework.

Graduation rates for URM’s vs. non-URM’s were not available for graduate students.

7.2 FTEF, SFR, Percentage T/TT Faculty
Our number of faculty have been increasing along with our student body size. Our Fall 2017 SFR (student/faculty ratio) of 29*, is comparable to the College of Engineering average of 30.3 and above the university average of 24.9. Our tenure density of 39% in Fall 2017 was comparable to the College of Engineering value of 41% and somewhat less than the university value of 44%, but we hired two new tenure-track faculty who started in Fall 2018 and are recruiting one more, so our tenure density should increase. However, recent trends to offer more release time for research, particularly for probationary faculty, may offset some of those potential increases in tenure density.

*Note that the SFR in the Required Data Elements (RDE) provided by Institutional Effectiveness and Analytics (IEA) shows a higher SFR than the numbers posted on their website, which lists 27.3.

We have hired in technical areas to support both our teaching and research, bearing in mind the need for full-time faculty to champion curriculum, research, and laboratory development in
our three main technical areas – mechanical systems design, mechatronics and controls, and thermal/fluids. It is expected that multiple tenured faculty members will retire during the next 6-year program planning period, and it will be important for the department to hire to maintain teaching and research excellence. Hiring decisions will be made in light of the future of the mechanical engineering field, as outlined in Section 4 of this report, as well as the mission of the department.

7.3 Additional Program Data Elements

Remaining Program Data Elements apply largely to our undergraduate program.

8. Assessment of Student Learning in GE courses, if any

This section is not applicable to the MSME program.

9. Appendices to the Report

Appendices listed are as follows:

A. MSME Project/Thesis Evaluation Forms
B. ME 201 Syllabus
C. BSME Program Planning Report
D. Part 1 Required Data Element from IEA
   Part 2 Required Data not included in submittal received from IEA
E. Accreditation Report Link
F. Letter of Accreditation from ABET
G. BSME Four-Year Plan
H. Example BSME Assessment Rubrics
I. New ABET BSME Outcomes with Performance Criteria
J. General Education Course Plans and Assessment
Appendix A MSME Project/Thesis Evaluation Forms

MSME PROJECT/THESIS ASSESSMENT FORM
SAN JOSE STATE UNIVERSITY

Student Name: ___________________________ SJSU ID: ___________________________

Project/Thesis Title: ____________________________________________________________

☐ ME 295A  ☐ ME 295B  ☐ ME 299 (Interim)  ☐ ME 299 (Final)  Semester: ________________

Evaluated by: ___________________________________________________________ Date: __________

Scores are on the scale of 0-4, with 4 indicating strong agreement, and 0 strong disagreement.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Motivation for the work was convincing and clear objectives were defined.</td>
<td></td>
</tr>
<tr>
<td>2 A thorough literature search was performed with proper citations, and an understanding of the cited literature was clearly evident.</td>
<td></td>
</tr>
<tr>
<td>3 A methodical, in-depth analysis and/or design of a mechanical engineering system was performed, using appropriate assumptions as needed.</td>
<td></td>
</tr>
<tr>
<td>4 Mathematical representations and computations were applied appropriately for graduate level work.</td>
<td></td>
</tr>
<tr>
<td>5 Science and engineering fundamentals were applied appropriately for graduate level work.</td>
<td></td>
</tr>
<tr>
<td>6 Modern tools (computational or experimental) were used effectively as needed.</td>
<td></td>
</tr>
<tr>
<td>7 Results of the work were presented effectively, using graphs and tables appropriately as needed.</td>
<td></td>
</tr>
<tr>
<td>8 The report was well written, with correct language and terminology used throughout.</td>
<td></td>
</tr>
<tr>
<td>9 Key points of the work were summarized effectively and meaningful conclusions were drawn.</td>
<td></td>
</tr>
<tr>
<td>10 Progress throughout the work was consistent with timely deliverables, while proactively soliciting input from the committee and incorporating accordingly.</td>
<td></td>
</tr>
</tbody>
</table>

AVERAGE:

Comments:

Grade thresholds:

\[
\begin{align*}
A &= 3.70-4.00, \ A- = 3.30-3.69, \\
B+ &= 3.00-3.29, \ B = 2.70-2.99, \ B- = 2.30-2.69, \\
C+ &= 2.00-2.29, \ C = 1.70-1.99, \ C- = 1.30-1.69, \\
D+ &= 1.00-1.29, \ D = 0.70-0.99, \ D- = 0.30-0.69, \\
F &= 0.00-0.29
\end{align*}
\]

2018 Feb 12
## MSME Project/Thesis Proposal Evaluation
San Jose State University  Department of Mechanical Engineering

<table>
<thead>
<tr>
<th>Title:</th>
<th>Project</th>
<th>Thesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Name:</td>
<td>SJSU ID:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evaluators</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Committee Chair:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Committee Member 1:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Committee Member 2:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Committee Chair</th>
<th>Committee Member 1</th>
<th>Committee Member 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptable</td>
<td>Acceptable w/ Improvement</td>
<td>Unacceptable</td>
<td>Acceptable</td>
</tr>
</tbody>
</table>

1. **The title** used effective wording to communicate the purpose and scope of the study accurately.

2. **The significance and impact** of the endeavor were presented convincingly, and it was evident how the work benefits society or advances state-of-the-art in the topic of study.

3. A sufficient **literature review** was conducted, and it revealed an understanding of relevance to the topic of study. A need that motivates the proposed project was identified.

4. A clear engineering **objective statement** was stated, and it had appropriate technical rigor for graduate level study. Design or performance specifications (if applicable) were explicitly identified.

5. A detailed description of the **methodology** and a realistic **implementation plan** were described, including required resources, contingency plans, and timeline.

6. Tangible **deliverables** were stated explicitly, in a way that can be objectively measured.

7. Wording, style, grammar, and spelling were used appropriately for graduate-level technical **writing**.

8. The proposal complied with all **format requirements** as stated in the ME 295/299 proposal guidelines.

9. **Overall**, the proposal established high confidence that the endeavor will be completed successfully.

Updated 2016 Nov 30
Appendix B ME 201 Course Syllabus (new GWAR course)

San José State University
Department of Mechanical Engineering
ME 201 Mechanical Engineering Project Planning
Section 01, Spring 2019

Course and Contact Information

Class Days/Time: Fridays 4:30 PM – 5:45 PM in person, plus online components
Classroom: Engineering ###
Registration Code: #####, 3 units
Prerequisites: Good standing in the MSME program.
Not available via Open University.
Instructor: TBA
Office Location: Engineering 310
Telephone: TBA
Email: TBA
Office Hours: TBA

Course Format

This class is run in mixed-mode, with in-person class meetings and online activities. Online components require use of the Canvas learning management system (LMS), accessed via https://sjsu.instructure.com/. Successful completion of course requirements necessitates accessing the course website frequently, typically at least twice a week on a regular basis. Technical support for Canvas is available at http://www.sjsu.edu/ecampus/. Important communications regarding this class may be sent via Canvas or to student email addresses listed in MySJSU, and thus each student is expected to maintain up-to-date contact information in both systems.

Course Description http://info.sjsu.edu/web-dbgen/catalog/courses/ME201.html

Preparation for an independent project or research investigation in mechanical engineering. Review of scholarly literature. Development of a formal objective statement or research hypothesis. Articulation of tangible deliverables. Planning of resources, tasks, and milestones. Preparation of a professional engineering proposal.

This course satisfies of the Graduate Writing Assessment Requirement (GWAR).
Course Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Perform a thorough literature search based on scholarly primary sources and write a professional literature review.
2. Develop a formal objective statement for a meaningful open-ended project or formulate a hypothesis for a contemporary research study in mechanical engineering.
3. Articulate specific and tangible deliverables that manifest an engineering solution or research evidence.
4. Develop a detailed project plan including structured tasks, available resources, significant milestones, and realistic timeline.
5. Write a comprehensive proposal for an independent engineering project or research investigation.
6. Conduct preliminary design, analysis, calculations, simulation, and/or feasibility study that contributes tangibly to meeting project objectives or interrogating a research hypothesis.

This MSME Program Educational Objectives (PEOs) that this course most directly addresses are:

- PEO #2: Professional and lifelong learning skills to be able to apply and extend theory to solve practical contemporary engineering problems.
- PEO #4: Strong verbal and written communication skills, including the ability to read, write and comprehend technical documents.
- PEO #5 (partially): Ability to think and work independently to perform design and in-depth analysis in solving open-ended mechanical engineering problems.

Required Reading

Selected reading will be assigned throughout the semester, including guide documents from ME faculty, articles from scholarly publications, and application notes.

Library Resources

The San Jose State University Library’s collection of journals, books, e-books, databases, and research tools will support the Mechanical Engineering Department and MS degree curriculum and research. The liaison librarian as listed at http://library.sjsu.edu/staff-directory/sjsu-library-subject-liaisons will provide faculty and students with research instruction and resources, as needed, in person and online through the library website http://library.sjsu.edu/. Research guides http://libguides.sjsu.edu/ are accessible for departments and subject areas, including a guide specific to mechanical engineering at http://libguides.sjsu.edu/me.

Course Requirements and Assignments

According to the Office of Graduate and Undergraduate Programs http://www.sjsu.edu/gup/syllabusinfo/, “Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course
(normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus."

The written documents in this course must be individual original work, and each will be due at incremental stages throughout the semester according to the schedule outlined at the end of this syllabus. The set of documents developed in this course will be compiled, revised, and submitted as a Full Proposal that is worth 70% of the course grade. The Full Proposal requires a minimum of 3000 words (approximately 12 pages), not including pictures, figures, tables, front matter, or appendices.

The proposal must follow professional writing standards according to ASME guidelines as described at https://www.asme.org/shop/proceedings/conference-publications/author-guidelines.

**Participation Tasks:** Throughout the semester there will be several participation tasks to promote active engagement. Specific examples include assigned discussion posts, checkpoint assignments (e.g., tentative titles, list of prospective mentors), and peer review. Tasks may be in-class or online, so it is important to attend class and to check Canvas regularly.

**Practical Research Skills:** As a requirement of this class, each student is required to identify a minimum of three distinct practical skills to be learned, reviewed, or expanded in order to ensure success in the proposed endeavor. Some of these skills may have been learned in prior coursework or industry experience, and accordingly students are encouraged to choose the ones that provide the highest new added value. Specific selection should, however, be guided by advice from prospective project or research mentors, with supporting input from the ME 201 course instructor if needed.

- Sensor principles and selection (e.g., strain gauges, thermocouples, load cells, ...)
- Actuator principles and selection (e.g., servomotors, solenoids, pneumatic cylinders, ...)
- Data acquisition principles and configuration (e.g., analog vs. digital signals, amplifiers, filters, ...)
- Engineering software coding (e.g., MATLAB, Python, C++, Java, ....)
- Software-driven instrument control (e.g., microcontrollers, serial communication, ...)
- Uncertainty analysis and error propagation
- Probability distributions, statistical inference, and significance testing
- Statistical design of experiments, factor effects, analysis-of-variance
- Experimental data fitting, regression models, and response surfaces
- Data file manipulation or image analysis (e.g., feature recognition, Fourier analysis, ...)
- Geometric dimensioning and tolerancing (GD&T)

Recommended tutorials or reading assignments will be provided by the ME faculty. In most cases the tutorials and reading will be broad-based and self-paced. Direct instruction from faculty will be provided only if needed for highly specialized apparatus or processes, and only if prior agreement has been reached with a faculty member who has already committed time and resources. In order to document adequate familiarity and proficiency, the student must complete and pass an associated quiz for each of the selected skills.
Grading Information

The course grade is calculated from a weighted sum of all graded components as follows:

- 10% for Participation Tasks
- 10% for Quizzes on practical research skills
- 20% for Literature Review
- 10% for Project Definition (objective or hypothesis statement, deliverables, evaluation metrics)
- 20% for Implementation Plan (tasks, resources, milestones, timing)
- 20% for Preliminary Work Report (engineering principles and theory, tangible accomplishments)
- 10% for Proposal Presentation

The Full Proposal is a compilation of the final revised versions of Literature Review, Project Definition, Implementation Plan, and Preliminary Work Report (70% of course grade).

This course is graded by letter grade. Percentage points correspond to letter grade as follows:

- 93.0-100 A
- 90.0-92.9 A-
- 87.0-89.9 B+
- 83.0-86.9 B
- 80.0-82.9 B-
- 77.0-79.9 C+
- 73.0-76.9 C
- 70.0-72.9 C-
- 67.0-69.9 D+
- 63.0-66.9 D
- 60.0-62.9 D-
- 0-59.9 F

Late Policy: Unless otherwise specified for a particular assignment, work that is submitted late will be accepted with reduced credit according to a depreciation rate of 1.5% for each late hour breached.

Exceptions: Any grading appeals or petitions must be communicated promptly in writing (or email). Exceptions will normally be evaluated at the very end of the semester in context with overall semester track record and all other exceptions class-wide. Special consideration for truly unavoidable and extenuating circumstances will depend on timeliness and supporting documentation (e.g., doctor's note or police report).

Classroom Protocol

Although University Policy F15-12 at [http://www.sjsu.edu/senate/docs/F15-12.pdf](http://www.sjsu.edu/senate/docs/F15-12.pdf) states that “Attendance shall not be used as a criterion for grading”, the policy also states, “Students are expected to attend all meetings for the courses in which they are enrolled as they are responsible for material discussed therein” and furthermore, “Participation may be used as a criterion for grading when the parameters and their evaluation are clearly defined in the course syllabus and the percentage of the overall grade is stated.”

University Policies

The link below contains university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. This information is maintained by the Office of Graduate and Undergraduate Programs at [http://www.sjsu.edu/gup/syllabusinfo/](http://www.sjsu.edu/gup/syllabusinfo/).
## Course Schedule

*Subject to change with fair notice via announcement in class or notification via Canvas.*

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Topic</th>
<th>Due Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1/26</td>
<td>Introduction and course logistics &lt;br&gt;Faculty research profiles and representative topics</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2/2</td>
<td>Faculty research profiles and representative topics &lt;br&gt;Writing &quot;genres&quot; (proposals, reports, theses, papers)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2/9</td>
<td>Literature searching (search tools, primary vs. secondary sources, citation management software) @ MLK Library</td>
<td>List of prospective objective statements or research hypotheses</td>
</tr>
<tr>
<td>4</td>
<td>2/16</td>
<td>Organizing and writing literature reviews &lt;br&gt;Plagiarism and copyright infringement @ MLK Library</td>
<td>Literature compilation (organized citations only)</td>
</tr>
<tr>
<td>5</td>
<td>2/23</td>
<td>Objective statements and research hypotheses &lt;br&gt;Articulating tangible and specific deliverables</td>
<td>List of prospective mentors</td>
</tr>
<tr>
<td>6</td>
<td>3/2</td>
<td>Functional requirements, design specifications, figures of merit, and other evaluation metrics</td>
<td>Draft of Literature Review</td>
</tr>
<tr>
<td>7</td>
<td>3/9</td>
<td>Writing with cohesion and coherence (Writing Center)</td>
<td>Literature Review</td>
</tr>
<tr>
<td>8</td>
<td>3/16</td>
<td>Benchmarking, verification, and validation</td>
<td>Draft of Project Definition</td>
</tr>
<tr>
<td>9</td>
<td>3/23</td>
<td>Implementation planning: milestones, tasks and subtasks, resources, and timeline</td>
<td>Project Definition</td>
</tr>
<tr>
<td>10</td>
<td>3/30</td>
<td><em>Cesar Chavez Day - no class meeting</em></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>4/6</td>
<td>Examples of applying engineering theory and graduate-level math in MSME research</td>
<td>Draft of Implementation Plan</td>
</tr>
<tr>
<td>12</td>
<td>4/13</td>
<td>Common flaws in grammar and writing style (Writing Center)</td>
<td>Implementation Plan</td>
</tr>
<tr>
<td>13</td>
<td>4/20</td>
<td>Best practices in visual representation of data</td>
<td>Practical research skill quizzes due</td>
</tr>
<tr>
<td>14</td>
<td>4/27</td>
<td>Document templates, version management, interactive editing</td>
<td>Preliminary Work Report</td>
</tr>
<tr>
<td>15</td>
<td>5/4</td>
<td>Best practices in professional oral presentation</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>5/11</td>
<td>Best practices in working with research mentors</td>
<td>Feedback from prospective mentors</td>
</tr>
</tbody>
</table>

The deadline for the compiled Full Proposal is the last day of instruction for the semester (Monday, May 14th).

Proposal Presentations will be held during the designated Final Exam period on **Wednesday May 16th, from 2:45 PM to 5:00 PM**. This will be an open forum to which all ME faculty will be invited.
APPENDIX C BSME PROGRAM PLANNING REPORT

PROGRAM PLANNING REPORT
SAN JOSE STATE UNIVERSITY

MECHANICAL ENGINEERING DEPARTMENT
BSME PROGRAM
COLLEGE OF ENGINEERING
WWW.SJSU.EDU/ME

Department Chair or School Director: Nicole Okamoto, Mechanical Engineering Department, One Washington Square, San Jose, CA 95192-0087, Nicole.okamoto@sjsu.edu, 408-924-4054

Faculty Program Plan Leader: Nicole Okamoto


Date of Report: December 14, 2018

Date Due to PPC: Fall 2018

Current Chair of Program Planning Committee: Mary Wilson

UGS Administrative Support for Program Planning: Nicole Mendoza, Nicole.Mendoza@sjsu.edu
## PROGRAM PLAN CHECKLIST

ABET accreditation report can be found at [https://drive.google.com/file/d/1w6sq5GqrSuRd89kk1aegolcir5VfjOeh/view?usp=sharing](https://drive.google.com/file/d/1w6sq5GqrSuRd89kk1aegolcir5VfjOeh/view?usp=sharing)

The document is set so that anyone with the link can view it.

<table>
<thead>
<tr>
<th>Program Planning Element</th>
<th>Location of information</th>
<th>Does it appear in the external report and on what page?</th>
<th>If no, on what page does it appear in the SJSU Program Planning Report</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. PROGRAM DESCRIPTIONS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Program Mission and Goals</td>
<td>Yes, pg 14-17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Curricular Content of Degrees, Minors, and Certificates</td>
<td>Yes, pg 78-83, 86-89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Service Courses</td>
<td>No</td>
<td></td>
<td>29</td>
</tr>
<tr>
<td><strong>2. SUMMARY OF PROGRESS, CHANGES, AND PROPOSED ACTIONS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Progress on action plan of previous program review</td>
<td>No</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>b. Significant changes to the program and context</td>
<td>Yes, pg 73-76</td>
<td></td>
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<tr>
<td><strong>3. ASSESSMENT OF STUDENT LEARNING</strong></td>
<td></td>
<td></td>
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<tr>
<td>a. Program Learning Objectives (PLO)</td>
<td>Old ones shown on pg 16-17, 28</td>
<td>New ones shown in Appendix H, 78-79.</td>
<td></td>
</tr>
<tr>
<td>b. Map of PLOs to University Learning Goals (ULG)</td>
<td>Yes, pg 19, 29</td>
<td></td>
<td></td>
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<tr>
<td>c. Matrix of PLOs to Courses</td>
<td>Yes, pg 30</td>
<td></td>
<td></td>
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<tr>
<td>d. Assessment Data</td>
<td>Yes, pg 35-72</td>
<td></td>
<td></td>
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<tr>
<td>e. Assessment Results and Interpretation</td>
<td>Yes, pg 35-72</td>
<td></td>
<td></td>
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<tr>
<td>f. Placement of Graduates</td>
<td>Yes, pg 21</td>
<td></td>
<td></td>
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<tr>
<td><strong>4. PROGRAM METRICS AND REQUIRED DATA ELEMENTS</strong></td>
<td></td>
<td></td>
<td>31-36</td>
</tr>
<tr>
<td>a. Enrollment</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Retention, and Graduation rates</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>c. Headcount in Sections</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>d. FTES, Induced Load Matrix</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>e. FTEF</td>
<td></td>
<td></td>
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<tr>
<td>f. SFR</td>
<td></td>
<td></td>
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<tr>
<td>g. Percentage T/TT Faculty</td>
<td></td>
<td></td>
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<tr>
<td><strong>5. PROGRAM RESOURCES</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>a. Faculty</td>
<td>Yes, pg 91-95, 102, 126-127</td>
<td></td>
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<tr>
<td>b. Support Staff</td>
<td>Yes, pg 122-124</td>
<td></td>
<td></td>
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<tr>
<td>c. Facilities</td>
<td>Yes, pg 105-110, 115, 302-318</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. OTHER STRENGTHS, WEAKNESSES, OPPORTUNITIES AND CHALLENGES</td>
<td>No</td>
<td>36-39</td>
<td></td>
</tr>
<tr>
<td>7. ASSESSMENT OF LEARNING IN GE</td>
<td></td>
<td>Appendix J 80-113</td>
<td></td>
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<tr>
<td>8. DEPARTMENT ACTION PLAN</td>
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<tr>
<td>9. APPENDICES CONTENT</td>
<td></td>
<td></td>
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<tr>
<td>a. Required Data Elements</td>
<td></td>
<td>40-62</td>
<td></td>
</tr>
<tr>
<td>b. Accreditation Report</td>
<td></td>
<td>63 (link given)</td>
<td></td>
</tr>
<tr>
<td>c. Letter of Accreditation</td>
<td>No</td>
<td>64-74</td>
<td></td>
</tr>
<tr>
<td>d. Curriculum flow charts, and mappings</td>
<td>No</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>e. Example Assessment rubrics</td>
<td>No (very limited)</td>
<td>76-77</td>
<td></td>
</tr>
<tr>
<td>f. Student success data summary</td>
<td>See assessment results, pg 35-72 in ABET report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Other (as determined by the program)</td>
<td>Alumni surveys, pg 20-25 Exit Surveys, pg 25-27</td>
<td>New ABET outcomes 78-79 General Education Course Plans and Assessment 80-113</td>
<td></td>
</tr>
</tbody>
</table>
1. **PROGRAM DESCRIPTION**

The BS Mechanical Engineering Program was formally established in 1958, first accredited by ECPD in 1963, and has been continuously accredited since. The BSME program is accredited by ABET (Accreditation Board for Engineering and Technology), with our most recent accreditation occurring in spring 2018. It has always had three unofficial focus areas, in early decades Thermofluids, Dynamics and Controls, and Mechanical Design. The Dynamics and Controls focus was revamped and modernized as Mechatronics in the second half of the 1990s.

In Fall 1996, the departments of Mechanical Engineering and Aerospace Engineering were merged to form the Department of Mechanical and Aerospace Engineering (MAE) Department. The MAE Department housed BS and MS degree programs in both disciplines until 2014, when the decision was made to again split the ME and AE programs into separate departments due to the growing size of the AE program. Today, the Mechanical Engineering Department has eleven full-time faculty members, one on FERP, and one with a split appointment between two departments as well as numerous part-time lecturers. We are recruiting for an additional tenure-track faculty member for Fall 2019.

The Mechanical Engineering Program has undergraduate population has undergone steady growth since the last Program Planning review. The student body is very diverse with a large minority population, many non-native English speaking students and a high percentage of working students. Our department website is [www.sjsu.edu/me](http://www.sjsu.edu/me). The program is held exclusively on campus, with the main office in Engr 310 and all labs and most classes held in the Engineering Building (except for an occasional online elective).

1a. **Program mission and goals**

   - Available in External Accreditation Report

   - Listed below

1b. **Curricular Content of Degrees, Minors, Certificates, and Credentials**

   - Available in External Accreditation Report

   - Listed below

1c. **Service Courses**

   - Available in External Accreditation Report

   - Listed below

ME 101 Dynamics and ME 111 Fluid Mechanics are taken by both Mechanical and Civil Engineering majors. ME 20 is taken by both Mechanical and Industrial and Systems Engineering majors.
2. SUMMARY OF PROGRESS, CHANGES, AND PROPOSED ACTIONS

2a. Progress on action plan of previous program review
   □ Available in External Accreditation Report
   X Listed below

   Our action plan from our previous Program Planning review focused largely on our MSME program. The only item that related to our BSME program was this: “Work with the Dean of Engineering to hire additional fulltime faculty in needed areas.” Since Fall 2014 when this action plan was developed, we hired six new faculty members.

   Dr. Feruza Amirkulova   specialty: acoustics and vibrations   joined Fall 2018
   Dr. Amir Armani         specialty: mechanical system design  joined Fall 2018
   Dr. Saied Bashash       specialty: mechatronics and controls joined Fall 2015
   Dr. Kathryn Gosselin    specialty: thermal/fluids        joined Fall 2015
   Dr. Crystal Han         specialty: thermal/fluids, microfluidics joined Spring 2018
   Dr. Vimal Viswanathan   specialty: product design      joined Fall 2016

   Dr. Gosselin left after the Spring 2018 semester, but we have been approved to hire in her area for Fall 2019. Dr. Fred Barez also moved 80% to Aviation and Technology. Dr. Amirkulova was hired in a similar area of expertise.

2b. Significant changes to the program and context, if any
   □ Available in External Accreditation Report
   X Listed below

3. ASSESSMENT OF STUDENT LEARNING

3a. Program Learning Objectives (PLO)
   □ Available in External Accreditation Report
   X Listed below

   The old PLO’s are given in the accreditation report. The new PLO’s along with associated performance criteria are shown in Appendix 9f. In terms of the WASC PLO rubric, our progress for the new PLO’s is as shown:

   Comprehensive List: Highly Developed – Outcomes are in line with ABET. Faculty have agreed upon performance criteria for each outcome. Criteria are explicit and measurable.

   Assessable Outcomes: Developed – We have developed performance criteria for each outcome and have determined what elements to use to demonstrate achievement of each performance criterion. We are not finished developing rubrics for the new outcomes.

   Alignment – Developed – Alignment is actually highly developed, but alignment hasn’t been completely written up or disseminated for the new outcomes.

Mechanical Engineering BSME Program Planning Report – Fall 2018
Assessment Planning: Highly Developed – We have an assessment schedule that allows for each outcome to be assessed twice during the 6-year assessment period. Our ABET report shows that we develop and implement improvements based on the results on our assessment process.

The Student Experience: Developed – Outcomes are given on most syllabi and on our website. Student had minimal input on creation of outcomes (as they were determined by ABET) or rubrics.

3b. Map of PLOs to University Learning Goals (ULG)

- Available in External Accreditation Report
- Listed below

3c. Matrix of PLOs to Courses

- Available in External Accreditation Report
- Listed below

3d. Assessment Data

- Available in External Accreditation Report
- Listed below

3e. Assessment Results and Interpretation

- Available in External Accreditation Report
- Listed below

3f. Placement of Grads

- Available in External Accreditation Report
- Listed below

4. PROGRAM METRICS AND REQUIRED DATA

The Required Data Elements discussed in this section are attached in Appendix D of this report.

4a. Enrollment, retention, (4 and 6 year) graduation rates, and graduates, including comparisons to college and university averages and university targets for total, URM, and Non-URM populations

- Available in External Accreditation Report
- Listed below

Enrollment: As an impacted program, we wish our undergraduate enrollment to remain relatively stable. Our Fall 2018 first-time transfer student enrollment was about 25 students lower than what we desired since Admissions raised our required GPA for admission to a 3.25.
Our associate dean is working with admissions to try to provide a more uniform number of new freshman and transfer students, although we know that there will always be variations as the percent admitted who enroll fluctuates.

Retention and Graduation—URM vs. non-URM: The Required Data Elements from IEA show only one ME course, ME 20, with a major gap in passing rate between URM (under-represented minority) and non-URM students. However, our graduation rates and 6-year retention rates for URM’s are lower than for non-URM’s. For example, the 6-year graduation rate was 44.4% URM’s and 62.5% for non-URM’s for Fall 2011 incoming freshman. If we examine the first-year retention rates, we see that in the most recent year, the rates for URM’s for both freshman and transfer students were actually higher than non-URM’s. However, the URM rate varied a lot from Fall 2012-2016, whereas the non-URM rate stayed relatively constant.

Data from CSU Dashboard shows a significant GPA gap of 0.38 between URM’s and non-URM’s for Phys 50. Moving from an average GPA of 1.95 (for URM’s) to 2.33 (for non-URM’s) could be very significant, since this means that the average URM does not receiving a passing grade for Phys 50, defined as a C- or better for our program. We also see a larger percentage of URM’s in Phys 49 vs. Phys 50 (35% in Phys 49 vs. 20% in Phys 50). The grade gap in Phys 49 is even larger, with average GPA’s for URM’s and non-URM’s of 1.6 and 2.0. Phys 49 is not required and was specifically set up for students who struggled in Calculus I or who have not taken physics in high school.

We see similar grade gaps in Math 30 PL (0.49 GPA gap), Math 30 (0.40 gap), Math 31 (0.38 gap), and Chem 1a (0.54 grade gap). So it appears that URM’s on average are less prepared for the rigorous math and physics. Most students who leave ME do so in their first two years, and by the time they hit the major ME courses in their junior and senior years, the grade gaps are much smaller. Removing these grade gaps cannot be done by any programs at SJSU alone, since causes likely go back to socioeconomic issues affecting students long before they come to SJSU. The department will do what it can to support initiatives that may have positive impacts on success rates of underprivileged students throughout their years at SJSU. Examples of some recent or upcoming initiatives are thus:

- Adding Phys 49 for students who are unprepared to tackle Phys 50
- Block scheduling of freshman, to help freshman meet other engineering students and feel a greater sense of belonging
- Hiring more advisors for the MESA program to provide greater support for students who are first in their families entering college (hiring process is ongoing)

Data from CSU Dashboard shows significant GPA gaps of 0.4 or higher in a number of ME classes (electives ME 136, 185, and 192), but average grades are well above passing for both URM’s and non-URM’s, so this isn’t as much of a cause for concern.
Graduation Rates: Here we see some very good news. Our 6-year graduation rates have steadily increased from 41% in Fall 2007 to 59% in Fall 2011. This means that 59% of freshman who started at SJSU in Fall 2011 with a major of ME graduated with any major within six year. We exceed 2015 university targets for total and non-URM populations (51.6% and 53.2%, respectively). As mentioned above, we have not met the 47.8% target for non-URMS with a rate of 44.4%. Four-year transfer student rates similarly have increased from 53% in Fall 2007 to 76%, just shy of the university goal of 80%. (Note that IEA does not have data for the 17-18 graduates available yet.) A number of factors have contributed to this increase:

1. We cut our units from 132 to 120, with most of the cuts happening in the upper division. Data element 13 shows that our graduates have been completing fewer units, with an average of 142 for freshman who graduated in Spring 2018 vs. 162 for Spring 2009 grads.
2. We have started offering summer courses -- in particular the prerequisite courses to ME 195a/b Senior Design I and II, which is a year-long sequence that only starts in the fall. Summer courses allow some students to reduce their time to graduation by an entire year.
3. We have eased prerequisites on some courses. Since our courses have a tight prerequisite sequence, this easing can save students a semester or year.
4. Our new transfer admissions requirements which give preference to students who have already completed Math 30, 31, and Phys 50 have led to incoming transfer students who can graduate faster.

It is still very challenging for freshman to graduate in four years because of the strong prerequisite stream going all the way back to Chem 1a and Math 30 Calculus I in the first semester of the freshman year. Anecdotally, it seems like almost the only students to do so are ones who come in with AP credit and who have the finances necessarily to not require too many hours of work. It would be extremely challenging for our program to reach the 4-year graduation goal of 35%. Similarly, if transfer students haven’t completed all of their math (through differential equations), physics (through Phys 52), CE 95 Statics, and MatE 25 Intro to Materials, prior to coming to SJSU, it is very difficult to graduate in two years – impossible without summer coursework. While our 2-year graduation rate for transfers may still go up from the 13% it’s currently at, it would be surprising to see it approach the goal of 35% for this reason.

For full-time freshman, if we look at graduation rates based on last major rather than their initial major, we see an increase. Student Data Warehouse shows 6-year graduation rates of full-time freshman whose last major was ME to be 74% for Fall 2011 entrants and 87% for Fall 2012 entrants.

4b. Headcount in sections

☐ Available in External Accreditation Report
X Listed below

Average section size is shown in the figure below since it wasn’t included in the RDE received from IEA. Comparisons between different departments can be difficult due to the differing numbers of labs, which have smaller sizes than lecture classes. However, it is clear that the average section size has dropped. Two factors may be affecting the drop. 1) With an increase in enrollment, we’ve had to
offer more lab sections, which pulls average numbers down. 2) We have attempted to reduce the
number of large (70+ student) classes to improve educational quality. One key class in that regard is
ME 101. Due to the high failure rate in that class, we dropped the average class size from about 55
to about 30 starting in Fall 2017.

![Figure 2 Average Section Size in ME Courses](image)

Changes in ME 101 Dynamics bears discussion, particularly since that is our highest failure rate
course. In previous years, part-time faculty led ME 101 Dynamics with little oversight from ME
faculty. Because of the importance of this course to student success in mechanical engineering, ME
faculty took more control of this class around Fall 2014. It became a more rigorous course with more
consistency between sections, including a common final exam, and failure rates spiked, as shown in
Figure 3. We have attempted to reduce the failure rate through a number of mechanisms.

1) We add a weekly problem-solving workshop. Although not required, we highly recommend that
students attend.
2) In Fall 2017 we dropped the class size as noted before.

These interventions seem to be reversing our high failure-rate trend, although more semesters of
data are needed. This course is taken by both mechanical and civil engineering majors. Interestingly,
civil engineering scores in Spring 2018 were on average 9 points below mechanical engineering
scores. This may be due in part to the fact that ME students need to achieve a C- or better to move
on to the next class in their programs, but CE students only need a D-. The chair of the Physics
Department noted a similar disparity between ME’s and CE’s in Physics 50, and we also have seen
this disparity in ME 111 Fluid Mechanics.

4c. FTES, Induced Load Matrix

□ Available in External Accreditation Report
Listed below

FTES (full time equivalent student) numbers for students enrolled in ME courses are shown in Figure 4. We see a steady increase, but it is expected the FTES will begin to drop slightly. A bubble of students is going through the program, due to high freshman admissions in Fall 2015 and transfer admissions in Fall 2017. Once those groups of students are through the program, the FTES should drop.

Figure 3 Percentage of Students Receiving D’s, F’s, and W’s in ME 101

Figure 4 Full-time Equivalent Students in the ME Department, both BS and MS
The Induced Course Load Matrix has been added to the appendix. The matrix is as expected, with most ME courses taken by ME’s, followed by CE’s, who take ME 101 and ME 111, and ISE’s who take ME 20. Other majors take ME course because they are in the process of changing major into ME (particularly Engineering and Undeclared students) or are taking electives in our department.

4d. FTEF, SFR, Percentage T/TT Faculty
   - Available in External Accreditation Report
   - Listed below

As shown in the RDE in Appendix D, our number of faculty have been increasing along with our student body size. Our Fall 2017 SFR (student to faculty ratio) of 29*, is comparable to the College of Engineering average of 30.3 and above the university average of 24.9. Our tenure density (percentage of classes taught by full-time faculty) of 39% in Fall 2017 was comparable to the College of Engineering value of 41% and somewhat less than the university value of 44%, but we hired two new tenure-track faculty who started in Fall 2018 and are recruiting one more, so our tenure density should increase. However, recent trends to offer more release time for research, particularly for probationary faculty, may offset some of those potential increases.

*Note that the SFR in the RDE provided by IEA shows a higher SFR than the numbers posted on their website, which lists 27.3.

5. PROGRAM RESOURCES
   5a. Faculty number and qualifications
      - Available in External Accreditation Report
      - Listed below

   5b. Support staff
      - Available in External Accreditation Report
      - Listed below

   5c. Facilities
      - Available in External Accreditation Report
      - Listed below

6. OTHER STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND CHALLENGES
   - Available in External Accreditation Report
   - Listed below
Strengths:

1) ABET identified one department strength as follows: “The program relies on experienced adjunct faculty members who are drawn from local area industries and government agencies. These valued faculty members provide an opportunity for students to gain insight into the engineering profession and enhance their overall undergraduate experience.” Most of our lecturers have been with us for many years and are very dedicated. In addition to teaching, many of them serve on MS project/thesis committees and also serve as consultants for undergraduate students working on projects. One faculty member leads projects with a local high school (Independence High), and another has worked with multiple students to publish their senior design work in conference proceedings.

2) We have a robust continuous improvement process. This process has resulted in the improvements outlined in our ABET report pages 73-76. For example, we added workshops and reduced class sizes from an average of 55 to 28 for our ME 101 Dynamics class. This class had been identified as a high failure rate class. These practices reduced our D/F rate for ME students by about 50% from Fall 2016 to Fall 2017.

3) We have a “hands-on” curriculum, with labs and/or projects embedded in many of our classes. Our mechatronics program has been a model for other universities, and our two-semester senior design sequence is a hallmark of our program. In this sequence, students work on year-long team projects that go from project initiation to analysis and design to construction and testing. The labs and hands-on projects lead to industry-ready graduates and appeal to a diversity of learning styles. Members of our Department Advisory Council have applauded this trait in our graduates.

4) Our students are exceptionally successful in national and international competitions run by organizations such as American Society of Mechanical Engineers and Society of Automotive Engineers, to name a few. Student publications have been increasing as well. See pages 64-65 in the ABET report for details of student achievements.

5) Our full-time faculty are very dedicated. They place a premium on excellent teaching and are also all involved with research and/or student projects. We have seen an increase in number of external grants and publications in recent years. Professional development activities by some faculty are outlined in the ABET report page 102. Externally funded grants from 2011-2017 are outlined in our ABET report, page 123. Several additional grants have been received since that time (John Lee, NSF MRI Grant co-PI for $450,274 and American Heart Association grant co-PI for $154,000; Vimal Viswanathan, NSF IUSE Grant co-PI with SJSU sub-award of $75,155; Saeid Bashash, CU Aerospace grant of $28,400; Winncy Du, CSU lab innovations grant of $14,557). Drs. Du and Hsu have both published well-received textbooks in their areas of expertise, and most full-time faculty are active in publishing in peer reviewed journals and/or conferences.

6) Our department, like the rest of SJSU, helps students transform their and their families’ lives. Money Magazine ranked SJSU #4 in the nation for being the “most transformative,” and our department is no exception. Many of our students come in as first in their families on college; 21% are under-represented minorities, and many have to work to put themselves through school. The degree they receive results in a major change to their economic futures.
Weaknesses:

1) Our 4-year graduation rate (and 2-year graduation rate for transfer students) continues to be low, although we have shown real improvements in recent years due to a variety of efforts (unit reductions, new admissions standards, prerequisite stream-lining, addition of summer classes, etc.)

2) We do not take as much advantage of our location as we could, in terms of getting students involved with internships and industry projects.

Opportunities:

1) We have the opportunity to take better advantage of our location and develop more relationships with industry, including industry-funded senior design projects.

2) As we have hired a lot of new research-active faculty in recent years, we have the opportunity for more undergraduates to get involved with research. Sponsored faculty research has been increasing, with Professors Bashash, Du, Lee, and Viswanath securing externally funded grants within the last year.

3) The department is exploring setting up a minor in mechatronics, which would provide advanced training in this area which is of such interest in the Silicon Valley.

Challenges:

1) As with the rest of SJSU, we continue to struggle with how to help our student body succeed, despite sometimes poor academic preparedness and outside family and work commitments. Our improving graduation rates show that we are making progress, but we expect that this challenge will always be with us.

2) Lab and office space: As we add research-active faculty, they need labs for research and office space. At the same time, as our student body grows, we need space for the hands-on projects that are a hallmark of our program. These sometimes competing needs for space pose a challenge, and we have had to deny some requests from students for project space. At the same time, some of our labs are very old with dilapidated facilities. For example, Engr 114a has partially plywood floors, built-in cabinets that are falling apart, and an electrical infrastructure that is not up to code. Lab Engr 192 has two potential offices that we could use as our faculty grows, but sewer gases regularly back up into that room, making the office space unusable for regular faculty occupation. Repeated requests to FD&O have not resulted in a solution. We have a large donated shaker table that could be used for our classes and research dealing with vibrations, but we cannot use it since it requires attachment to the building foundation, costing significant money. In recent years we have augmented department space by holding our largest senior design class (approx. 35 students per semester and over 15 international student in the summer) in a 9000 square foot off-site former truck garage close to campus. The owner graciously let us use that space for free. However, there has been a change in ownership and our lease for that space has recently been revoked, increasing the space problem considerably.

3) Labs and hands-on projects take a lot more time and money than a lecture-based class. Finding money to fund projects and update labs continues to be a challenge. ABET initially was going to
cite us for a weakness due to outdated equipment in our student labs with insufficient funds for upkeep until the college infused additional funds for equipment during the 17-18 academic year. If we could use all of our SSETF funds for equipment and supply upgrades, we would have no problems. However, we need to use a majority of those funds to pay TA’s and student assistants for labs.

In terms of hands-on projects, although we would like more industry-funded senior design projects, those take additional time to solicit and coordinate at a time when the number of senior design students is at an all-time high. Additionally, for our students to continue to excel in hands-on skills, they need access to quality fabrication facilities. Those facilities are expensive to develop and maintain. We used to augment our department and college facilities by sending students to TechShop, but since they went bankrupt and closed, that is no longer an option. We also have limited personnel to assist with fabrication. We have one technician for our entire department, who must maintain numerous labs in addition to overseeing our machine shop, and the technicians in the COE’s Central Shops are spread very thin.

7. ASSESSMENT OF STUDENT LEARNING IN GE COURSES
All General Education materials are included in Appendix J.

8. DEPARTMENT ACTION PLAN
1) ABET has developed a new set of learning outcomes required for all engineering programs. We have developed new performance criteria, but we still need to develop new assessment rubrics to bring us in line with these new outcomes. The new criteria are listed in Appendix 8f.

2) We are exploring the possibility of starting a minor in mechatronics, in conjunction with Computer and Electrical Engineering. Engineering is becoming an increasingly multidisciplinary field. Such a minor would give electrical and computer engineering students a stronger background in hardware and mechanical engineering students a stronger background in software. We have some mechanical engineering students interested in this area who now do a minor in computer science, but this isn’t ideal since that minor does not focus on the skills that are most needed by our students. Our recent survey of alumni shows that they are interested in expanded mechatronics offerings in our curriculum. This minor would also be consistent with a recent survey of ASME members, who indicated that in the future mechanical engineers will need to have more multidisciplinary skills.

3) We need to develop a long-term plan to deal with space and fabrication needs. With our increasing space limitations, we need to develop a guideline for student projects that includes consideration of space needs. We should also assess what fabrication skills are needed by our graduates, where and in what classes (or workshops) that training will occur, how we will pay for the equipment, and how we will ensure student safety. Such a plan will involve a broader investigation of industry needs and collaboration with the COE dean’s office.

4) We would like to enhance our alumni and industry involvement. In Spring 2018 we hosted our first alumni event in many years. We would like to get both alumni and industry members more involved as project coaches, sponsors, and design review members. As a start, we will invite alumni to our senior design presentations in May 2019. We also are working to expand our Department Advisory Council with members from more industries.
5) We want to improve the professional development of our students before they graduate. This may include items such as the following:

   a. an optional career planning course, including emphasis on the job search.

   b. workshops on technical subjects such as geometric dimensioning and tolerancing (GD&T) or finite element analysis as well as courses or workshops that offer certification in computer-aided design software such as Solidworks.

   c. an industry speaker series where students hear from engineers about what their work is like or from industry leaders who are looking to the future

   d. new courses on emerging topics – we may offer these courses ourselves or else recommend that our students take such courses offered by other departments as electives

To help provide us with additional insight as to which skill sets need to be added or augmented, we will survey industry members either via our Department Advisory Council and/or our alumni network.

Appendix D Required Exhibits

Note that the Program Planning Data Elements, received as the Required Data Elements (RDE) from Institutional Effectiveness and Analytics (IEA), and the Exhibits required in the template for accredited program do not match. The RDE from IEA are attached as Appendix 9a Part 1. The exhibits required in the template that are not included in the RDE are included as Appendix 9a Part 2.

Appendix D Part 1 Required Data Element from IEA

As part of the RDE Data Element 1, we must explain how we meet EO 1071’s requirement that 51% or more of our classes are “core”. In the BSME program, 93 units are required major courses (or courses “in preparation for the major”), 9 are selected electives, and 18 are general education. Thus, we greatly exceed the 51% requirement.
Number of units in the program core
As part of program planning, departments need to verify that they are following CSU Executive Order 1071, revised January 20, 2017. In particular, concentration-specific units must be less than half of the total units required for the major. Please see the current SJSU catalog and verify that units of the department's majors and any concentrations are consistent with the policy.

To review current units in the core, visit the SJSU catalog at info.sjsu.edu
Applications and admissions
The number who applied, were admitted, and enrolled in state-supported programs by level. The percentage yield from admissions is shown on the right.
Program Planning—Data Element 3

Migration of majors

The number of graduates who came to SJSU as freshmen and either started or completed their studies in this program along with their other programs if they changed (cumulative 2009-2013 entering cohorts).

**Freshman in Mechanical Engineering ultimately graduated in . . .**

<table>
<thead>
<tr>
<th>Major</th>
<th>% (N=?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineering</td>
<td>66% (N=111)</td>
</tr>
<tr>
<td>Industrial Technology</td>
<td>4% (N=7)</td>
</tr>
<tr>
<td>Bus Admin/Finance</td>
<td>2% (N=4)</td>
</tr>
<tr>
<td>Design Studies</td>
<td>2% (N=4)</td>
</tr>
<tr>
<td>Bus Admin/Management Info Syst</td>
<td>2% (N=3)</td>
</tr>
<tr>
<td>Computer Science</td>
<td>2% (N=3)</td>
</tr>
<tr>
<td>Economics</td>
<td>2% (N=3)</td>
</tr>
<tr>
<td>Industrial/Syst Engineering</td>
<td>2% (N=3)</td>
</tr>
<tr>
<td>Aviation</td>
<td>1% (N=2)</td>
</tr>
<tr>
<td>Civil Engineering</td>
<td>1% (N=2)</td>
</tr>
<tr>
<td>Communication Studies</td>
<td>1% (N=2)</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>1% (N=2)</td>
</tr>
<tr>
<td>Journalism</td>
<td>1% (N=2)</td>
</tr>
</tbody>
</table>

**Graduates in Mechanical Engineering originally started in . . .**

<table>
<thead>
<tr>
<th>Major</th>
<th>% (N=?)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineering</td>
<td>66% (N=111)</td>
</tr>
<tr>
<td>Undeclared</td>
<td>13% (N=21)</td>
</tr>
<tr>
<td>Engineering</td>
<td>7% (N=12)</td>
</tr>
<tr>
<td>Aerospace Engineering</td>
<td>9% (N=5)</td>
</tr>
<tr>
<td>Electrical Engineering</td>
<td>3% (N=5)</td>
</tr>
<tr>
<td>Computer Engineering</td>
<td>2% (N=4)</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>1% (N=2)</td>
</tr>
</tbody>
</table>

The percentage represents freshmen entrants to this major who graduated in the majors shown through summer 2016. Students who did not graduate are not included in this calculation.

This percentage shows graduates in this major, through summer 2016, who entered as freshmen in the majors shown. Students who did not graduate are not included in this calculation.
Courses with high rates of D, F, and WU grades
Undergraduate courses in the department with an unusually high percentage of attempts resulting in non-advancing grades. These could represent curricular bottlenecks for students needing these classes.

Classes with highest non-advancing grades (cumulative 2014 to 2018)

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Title</th>
<th>Course Level</th>
<th>DFW Rate</th>
<th>Total D/F/W/NC Grades</th>
<th>Total Course Attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 0101</td>
<td>Dynamics</td>
<td>Upper Division</td>
<td>23%</td>
<td>342</td>
<td>1,462</td>
</tr>
</tbody>
</table>
Program Planning—Data Element 5

Courses with grade gap for URM students
Undergraduate courses in the department with a gap in underrepresented minority (URM) versus non-URM student grades earned. Gaps are shown when the percentage earning a C- or better was statistically significant at p < 0.01.

Courses with significant gaps (cumulative 2014 to 2018)

<table>
<thead>
<tr>
<th>Course</th>
<th>URM Rate</th>
<th>Non-URM Rate</th>
<th>Gap in passing rate between URM and non-URM students</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 0020</td>
<td>89%</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>ME 0195B</td>
<td>98%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing cumulative passing rate (C- or better)](image-url)
Undergraduate retention rates

The number of new undergraduates who entered the program and their rate of persistence one year later in any program at SJSU. Additional detail is provided on underrepresented minority (URM) students in the program.

First-time freshmen, full-time at entry

<table>
<thead>
<tr>
<th>URM Students</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
<th>Fall 2014</th>
<th>Fall 2015</th>
<th>Fall 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>29</td>
<td>146</td>
<td>84</td>
<td>125</td>
<td>65</td>
</tr>
<tr>
<td>Non-URM Students</td>
<td>27</td>
<td>100</td>
<td>63</td>
<td>93</td>
<td>46</td>
</tr>
<tr>
<td>Program Total</td>
<td>86%</td>
<td>84%</td>
<td>89%</td>
<td>94%</td>
<td>94%</td>
</tr>
</tbody>
</table>

Upper division transfers from CA community colleges

<table>
<thead>
<tr>
<th>URM Students</th>
<th>Fall 2012</th>
<th>Fall 2013</th>
<th>Fall 2014</th>
<th>Fall 2015</th>
<th>Fall 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td>107</td>
<td>84</td>
<td>100</td>
<td>75</td>
</tr>
<tr>
<td>Non-URM Students</td>
<td>18</td>
<td>78</td>
<td>60</td>
<td>73</td>
<td>54</td>
</tr>
<tr>
<td>Program Total</td>
<td>95%</td>
<td>94%</td>
<td>89%</td>
<td>88%</td>
<td>89%</td>
</tr>
</tbody>
</table>
Cohort graduation rates and goals

State-supported program graduation rates are shown by level of entry. Students are tracked under their major at admission, but graduation in any SJSU program counts toward the department’s graduation rate.
Native junior graduation rates

Rates for full-time freshman entrants from any major who were in this major as of the fifth semester. This view may be informative for undergraduate programs with a large number of incoming changes of major.

Method notes
This version of the graduation rate is similar to a typical freshman cohort rate, only it attributes the credit to whatever major the student held as of the start of the junior year. However, the starting point of the cohort is still the freshman admission term. The graduation is attributed to this major regardless of the ultimate degree major.
Enrollment in minors
Headcount of undergraduates in department minors, if offered.

Undergraduate minors

No undergraduate minors to report for this department.

Interpretation
Counts are shown for declared minors. Note that some students begin taking courses in the minor and only declare it officially when they are close to completion. Some seniors also drop a minor at the end if it could delay graduation.
Faculty size and ratios

Tenure density is for active faculty based on fall payroll. All other measures are based on class/supervision assignments to permanent faculty and lecturers, but do not account for leaves and non-teaching assignments.
### Predictors of timely graduation

A statistical model of factors that may help explain the likelihood of graduating within six years for frosh who entered this department’s programs and graduated anywhere at SJSU.

#### Predictors of freshman graduation within six years (finishing in any major)

<table>
<thead>
<tr>
<th>Predictor Description</th>
<th>Observed Difference</th>
<th>Significance</th>
<th>Strength of Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher First Term GPA</td>
<td>221% higher odds of graduating</td>
<td>p &lt; .0001</td>
<td>Strong</td>
</tr>
<tr>
<td>Higher First Term Units</td>
<td>17% higher odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Completed Area E First Year</td>
<td>41% higher odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>HS GPA of 3.0 or Higher</td>
<td>13% higher odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Completed Area B2 First Year</td>
<td>Not meaningful</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Pell Recipient</td>
<td>Not meaningful</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Completed Area B3 First Year</td>
<td>Not meaningful</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4% lower odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Santa Clara County Resident</td>
<td>11% lower odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Completed Area B4 First Year</td>
<td>13% lower odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Parent Attended College</td>
<td>18% lower odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Completed Area B1 First Year</td>
<td>62% lower odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Developmental Math Need</td>
<td>50% lower odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>Developmental English Need</td>
<td>38% lower odds of graduating</td>
<td>(not sig.)</td>
<td></td>
</tr>
<tr>
<td>URM</td>
<td>57% lower odds of graduating</td>
<td>p &lt; .01</td>
<td>Strong</td>
</tr>
</tbody>
</table>

**Interpretation**

Predictors with a significance level of p < 0.01 or lower are likely to represent nonrandom differences in student outcomes. The predictors are sorted from the most positive associations with graduation to the most negative. Predictors labeled as “not sig.” were not statistically significant in this model and could be due to random chance. Results depend on having sufficient sample sizes; programs with small frosh admissions may not have any significant predictors.
**Demand for the department’s courses by college**

Full-time equivalent students (FTES) in the department’s courses segmented by students’ major college. This can reflect service courses and crossover in requirements or interests between programs.

<table>
<thead>
<tr>
<th>Major College</th>
<th>Fall 2014</th>
<th>Spring 2015</th>
<th>Fall 2015</th>
<th>Spring 2016</th>
<th>Fall 2016</th>
<th>Spring 2017</th>
<th>Fall 2017</th>
<th>Spring 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Engineering</td>
<td>309</td>
<td>279</td>
<td>339</td>
<td>303</td>
<td>352</td>
<td>312</td>
<td>366</td>
<td>348</td>
</tr>
<tr>
<td>Humanities and the Arts</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Science</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Social Sciences</td>
<td></td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Health and Human Sciences</td>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Undeclared/Other</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total Department FTES</strong></td>
<td>317</td>
<td>285</td>
<td>345</td>
<td>307</td>
<td>357</td>
<td>316</td>
<td>371</td>
<td>352</td>
</tr>
</tbody>
</table>
**Program Planning—Data Element 13**

**Average units on completion of undergraduate degree**

The average cumulative undergraduate units earned at the time the degree was awarded. It includes units transferred from other institutions as well as any units earned that were not required for the degree.

Averages are shown by year of spring graduation. Fall and summer degrees are not shown here.
# Average frosh graduation rates by college

The percentage of first-time, full-time frosh who entered the college’s majors and finished anywhere at SJSU.

### Frosh 4-Year Rate

<table>
<thead>
<tr>
<th>Cohort College</th>
<th>Semester of Entry</th>
<th>Fall 2006</th>
<th>Fall 2007</th>
<th>Fall 2008</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>Applied Sciences and Arts</td>
<td>7%</td>
<td>7%</td>
<td>9%</td>
<td>9%</td>
<td>11%</td>
<td>14%</td>
<td>15%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>9%</td>
<td>13%</td>
<td>14%</td>
<td>12%</td>
<td>23%</td>
<td>12%</td>
<td>23%</td>
<td>22%</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>10%</td>
<td>11%</td>
<td>12%</td>
<td>14%</td>
<td>32%</td>
<td>35%</td>
<td>24%</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
<td>2%</td>
<td>2%</td>
<td>3%</td>
<td>2%</td>
<td>4%</td>
<td>5%</td>
<td>7%</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Humanities and the Arts</td>
<td>8%</td>
<td>7%</td>
<td>11%</td>
<td>7%</td>
<td>13%</td>
<td>14%</td>
<td>15%</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>7%</td>
<td>5%</td>
<td>9%</td>
<td>7%</td>
<td>9%</td>
<td>9%</td>
<td>20%</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>Social Sciences</td>
<td>9%</td>
<td>12%</td>
<td>15%</td>
<td>15%</td>
<td>18%</td>
<td>21%</td>
<td>32%</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Undergraduate Studies</td>
<td>9%</td>
<td>8%</td>
<td>7%</td>
<td>12%</td>
<td>9%</td>
<td>6%</td>
<td>9%</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>SJSU Average</td>
<td>7%</td>
<td>8%</td>
<td>9%</td>
<td>9%</td>
<td>11%</td>
<td>10%</td>
<td>14%</td>
<td>15%</td>
<td></td>
</tr>
</tbody>
</table>

### Frosh 6-Year Rate

<table>
<thead>
<tr>
<th>Semester of Entry</th>
<th>Fall 2005</th>
<th>Fall 2006</th>
<th>Fall 2007</th>
<th>Fall 2008</th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>47%</td>
<td>43%</td>
<td>46%</td>
<td>51%</td>
<td>57%</td>
<td>63%</td>
<td>62%</td>
<td></td>
</tr>
<tr>
<td>55%</td>
<td>53%</td>
<td>58%</td>
<td>61%</td>
<td>67%</td>
<td>76%</td>
<td>65%</td>
<td></td>
</tr>
<tr>
<td>65%</td>
<td>53%</td>
<td>43%</td>
<td>63%</td>
<td>64%</td>
<td>79%</td>
<td>63%</td>
<td></td>
</tr>
<tr>
<td>40%</td>
<td>39%</td>
<td>39%</td>
<td>43%</td>
<td>47%</td>
<td>55%</td>
<td>55%</td>
<td></td>
</tr>
<tr>
<td>43%</td>
<td>49%</td>
<td>47%</td>
<td>52%</td>
<td>53%</td>
<td>65%</td>
<td>61%</td>
<td></td>
</tr>
<tr>
<td>40%</td>
<td>43%</td>
<td>46%</td>
<td>46%</td>
<td>53%</td>
<td>60%</td>
<td>62%</td>
<td></td>
</tr>
<tr>
<td>51%</td>
<td>52%</td>
<td>51%</td>
<td>50%</td>
<td>62%</td>
<td>67%</td>
<td>63%</td>
<td></td>
</tr>
<tr>
<td>47%</td>
<td>49%</td>
<td>50%</td>
<td>54%</td>
<td>57%</td>
<td>59%</td>
<td>49%</td>
<td></td>
</tr>
<tr>
<td>46%</td>
<td>47%</td>
<td>48%</td>
<td>52%</td>
<td>57%</td>
<td>62%</td>
<td>57%</td>
<td></td>
</tr>
</tbody>
</table>
## Average undergraduate transfer graduation rates by college

Rates for upper division transfers from CA community colleges who entered the college’s majors.

### Transfer 2-Year Rate

<table>
<thead>
<tr>
<th>Cohort College</th>
<th>Semester of Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Sciences and Arts</td>
<td>16% 21% 20% 25% 33% 29% 31%</td>
</tr>
<tr>
<td>Business</td>
<td>21% 27% 22% 21% 25% 27% 31%</td>
</tr>
<tr>
<td>Education</td>
<td>20% 22% 35% 35% 42% 37% 45%</td>
</tr>
<tr>
<td>Engineering</td>
<td>3% 3% 4% 5% 4% 9% 7%</td>
</tr>
<tr>
<td>Humanities and the Arts</td>
<td>8% 12% 14% 16% 19% 14% 13%</td>
</tr>
<tr>
<td>Science</td>
<td>5% 6% 4% 15% 7% 9% 16%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>29% 37% 35% 43% 37% 42% 47%</td>
</tr>
<tr>
<td>Undergraduate Studies</td>
<td>20% 13% 10% 11% 11% 9% 12%</td>
</tr>
<tr>
<td>SJSU Average</td>
<td>17% 18% 19% 22% 24% 23% 27%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester of Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2009</td>
</tr>
<tr>
<td>Fall 2010</td>
</tr>
<tr>
<td>Fall 2011</td>
</tr>
<tr>
<td>Fall 2012</td>
</tr>
<tr>
<td>Fall 2013</td>
</tr>
<tr>
<td>Fall 2014</td>
</tr>
<tr>
<td>Fall 2015</td>
</tr>
</tbody>
</table>

### Transfer 4-Year Rate

<table>
<thead>
<tr>
<th>Cohort College</th>
<th>Semester of Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applied Sciences and Arts</td>
<td>58% 67% 68% 77% 76% 77% 77%</td>
</tr>
<tr>
<td>Business</td>
<td>65% 71% 75% 84% 75% 79% 75%</td>
</tr>
<tr>
<td>Education</td>
<td>66% 75% 63% 79% 74% 81% 75%</td>
</tr>
<tr>
<td>Engineering</td>
<td>46% 55% 51% 66% 66% 60% 64%</td>
</tr>
<tr>
<td>Humanities and the Arts</td>
<td>50% 58% 60% 60% 65% 68% 70%</td>
</tr>
<tr>
<td>Science</td>
<td>48% 55% 50% 58% 71% 70% 67%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>64% 69% 74% 77% 77% 80% 78%</td>
</tr>
<tr>
<td>Undergraduate Studies</td>
<td>50% 71% 60% 64% 47% 55% 70%</td>
</tr>
<tr>
<td>SJSU Average</td>
<td>58% 66% 67% 70% 70% 72% 73%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester of Entry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2007</td>
</tr>
<tr>
<td>Fall 2008</td>
</tr>
<tr>
<td>Fall 2009</td>
</tr>
<tr>
<td>Fall 2010</td>
</tr>
<tr>
<td>Fall 2011</td>
</tr>
<tr>
<td>Fall 2012</td>
</tr>
<tr>
<td>Fall 2013</td>
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### Average graduate student graduation rates by college

Rates for state-supported master’s degree programs in the college

#### Graduate 2-Year Rate

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<th>Cohort College</th>
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<tr>
<td>Applied Sciences and Arts</td>
<td>34% 39% 29% 32% 38% 36% 29%</td>
</tr>
<tr>
<td>Business</td>
<td>43% 100% 86% 86% 85%</td>
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<tr>
<td>Education</td>
<td>60% 57% 54% 57% 59% 57% 51%</td>
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<tr>
<td>Engineering</td>
<td>38% 36% 43% 47% 60% 71% 70%</td>
</tr>
<tr>
<td>Humanities and the Arts</td>
<td>16% 22% 29% 31% 33% 19% 29%</td>
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<tr>
<td>Science</td>
<td>16% 18% 18% 29% 30% 13% 34%</td>
</tr>
<tr>
<td>Social Sciences</td>
<td>26% 30% 30% 25% 30% 28% 36%</td>
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<tr>
<td>SJSU Average</td>
<td>35% 36% 36% 39% 49% 53% 54%</td>
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#### Graduate 4-Year Rate

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<td>68% 66% 79% 82% 76% 76% 82%</td>
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<td>Business</td>
<td>83% 71% 89% 100% 100%</td>
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<td>Education</td>
<td>74% 83% 83% 79% 85% 87% 91%</td>
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<td>Engineering</td>
<td>73% 73% 80% 75% 77% 78% 83%</td>
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<td>Humanities and the Arts</td>
<td>64% 59% 67% 65% 67% 70% 66%</td>
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<tr>
<td>Science</td>
<td>46% 41% 51% 46% 42% 58% 63%</td>
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<td>52% 55% 66% 60% 60% 62% 62%</td>
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<tr>
<td>SJSU Average</td>
<td>68% 68% 76% 71% 71% 74% 79%</td>
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**URM Frosh Graduation Rate Gap**

Identifies whether underrepresented minority (URM) students who entered as frosh are graduating at similar rates as non-URM students. Comparisons are provided between the department, college, and university averages by incoming cohort year.

Values represent the percentage point difference between non-URM and URM student 6-year graduation rates for full-time frosh entrants. A negative number means the URM student graduation rate was lower than the non-URM rate.
### Appendix D Part 2 Required Data not Included in Submittal Received from IEA

#### Exhibit 1 – Number of Course Sections with Course Prefix of ME

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#### Activity Courses (ACT)

| Lower Division Course Count | 1 |
| Section Count | 1 |
| Course Count Total | 1 |
| Section Count Total | 1 |

#### Lab Courses (LAB)

| Lower Division Course Count | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Section Count | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Upper Division Course Count | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 1 | 2 | 2 |
| Section Count | 3 | 4 | 4 | 7 | 8 | 7 | 7 | 8 | 7 | 8 | 9 | 4 | 6 | 7 |
| Course Count Total | 1 | 1 | 1 | 1 | 2 | 3 | 3 | 3 | 4 | 3 | 2 | 2 | 1 | 2 |
| Section Count Total | 3 | 4 | 4 | 7 | 9 | 8 | 8 | 8 | 9 | 8 | 9 | 4 | 6 | 7 |

*Mechanical Engineering BSME Program Planning Report – Fall 2018*
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Exhibit 2 Average Headcount per Section – See section 4b and the table below.

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Cross listed course redistributions are included in this report

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Exhibit 3 Student to Faculty Ratio – See Required Data Elements from IEA, Data Element 10.

Exhibit 4 Induced Course Load Matrix – See below for Spring 2018.

<table>
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<th>Upper Division</th>
<th>Graduate</th>
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<td>Chemical Engineering</td>
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<td>Civil Engineering</td>
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<td>141</td>
<td>142</td>
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<td>Computer Engineering</td>
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<td>3</td>
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<td>Electrical Engineering</td>
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<tr>
<td>Engineering</td>
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<td>2</td>
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<td>Environmental Studies</td>
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<td>Industrial/Syst Engineering</td>
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<td>23</td>
<td>3</td>
<td>26</td>
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<tr>
<td>Materials Engineering</td>
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<tr>
<td>Mathematics</td>
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<td>Mechanical Engineering</td>
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<td>Physics</td>
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<tr>
<td>Software Engineering</td>
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<td><strong>Total</strong></td>
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<td><strong>175</strong></td>
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Exhibit 5 Applied, Admitted, Enrolled -- See Required Data Elements from IEA, Data Element 2
Exhibit 6 Enrollment by Class Level with FTES -- See section 4c for FTES enrollment. See below for enrollment of ME majors in courses based on class level.

### Full Time Equivalent Students by Class Level (for Major Only)
**Program: MECH - Mechanical Engineering**

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<td>613.77</td>
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Exhibit 7 Enrollment by Major and Concentration – See section 4c.
Exhibit 8 Degrees Awarded – See below.

### Degrees Awarded by Major & Concentration
**Broken down by Type**
**Mechanical Engineering**

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<td>Total</td>
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Exhibit 9 First Year Retention Rates -- See Required Data Elements from IEA, Data Element 6
Exhibit 10 Graduation Rates - See Required Data Elements from IEA, Data Element 7
T/TT instructional faculty percentage -- See Required Data Elements from IEA, Data Element 10
Appendix E Accreditation Report

Due to the size of the file, please find it at
https://drive.google.com/file/d/1w6sq5GqrSuRd89kK1aegolcir5VfjOeh/view?usp=sharing
August 27, 2018

Sheryl Ehrman
Dean, College of Engineering
San Jose State University
One Washington Square
San Jose, CA 95192-0080

Dear Dr. Ehrman:

The Engineering Accreditation Commission (EAC) of ABET recently held its 2018 Summer Meeting to act on the program evaluations conducted during 2017-2018. Each evaluation was summarized in a report to the Commission and was considered by the full Commission before a vote was taken on the accreditation action. The results of the evaluation for San Jose State University are included in the enclosed Summary of Accreditation Actions. The Final Statement to your institution that discusses the findings on which each action was based is also enclosed.

The policy of ABET is to grant accreditation for a limited number of years, not to exceed six, in all cases. The period of accreditation is not an indication of program quality. Any restriction of the period of accreditation is based upon conditions indicating that compliance with the applicable accreditation criteria must be strengthened. Continuation of accreditation beyond the time specified requires a reevaluation of the program at the request of the institution as noted in the accreditation action. ABET policy prohibits public disclosure of the period for which a program is accredited. For further guidance concerning the public release of accreditation information, please refer to Section II.A. of the 2017-2018 Accreditation Policy and Procedure Manual (available at www.abet.org).

A list of accredited programs is published annually by ABET. Information about ABET accredited programs at your institution will be listed in the forthcoming ABET Accreditation Yearbook and on the ABET web site (www.abet.org).

It is the obligation of the officer responsible for ABET accredited programs at your institution to notify ABET of any significant changes in program title, personnel, curriculum, or other factors which could affect the accreditation status of a program during the period of accreditation stated in Section II.H. of the 2017-2018 Accreditation Policy and Procedure Manual (available at www.abet.org).
ABET requires that each accredited program publicly state the program’s educational objectives and student outcomes as well as publicly post annual student enrollment and graduation data as stated in Section 2.1.6. of the Accreditation Policy and Procedure Manual (available at www.abet.org).

ABET will examine all newly accredited programs’ websites within the next two weeks to ensure compliance.

Please note that appeals are allowed only in the case of Not to Accredit actions. Also, such appeals may be based only on the conditions stated in Section 2.1. of the 2017-2018 Accreditation Policy and Procedure Manual (available at www.abet.org).

Sincerely,

[Signature]

Ann L. Kenimer, Chair
Engineering Accreditation Commission

Enclosure: Summary of Accreditation Action
Final Statement

cc: Mary A. Papazian, President
    Jinny Rhee, Associate Dean of the College of Engineering
    Jerome Philip Lavelle, Team Chair
Software Engineering (BS)

Accredit to September 30, 2024. A request to ABET by January 31, 2023 will be required to initiate a reaccreditation evaluation visit. In preparation for the visit, a Self-Study Report must be submitted to ABET by July 01, 2023. The reaccreditation evaluation will be a comprehensive general review.

This is a newly accredited program. Please note that this accreditation action extends retroactively from October 01, 2016.

Aerospace Engineering (BS)
Biomedical Engineering (B.S.)
Civil Engineering (BS)
Computer Engineering (BS)
Electrical Engineering (BS)
Industrial and Systems Engineering (BS)
Mechanical Engineering (BS)

Accredit to September 30, 2024. A request to ABET by January 31, 2023 will be required to initiate a reaccreditation evaluation visit. In preparation for the visit, a Self-Study Report must be submitted to ABET by July 01, 2023. The reaccreditation evaluation will be a comprehensive general review.

Chemical Engineering (BS)
Materials Engineering (BS)

Accredit to September 30, 2020. A request to ABET by January 31, 2019 will be required to initiate a reaccreditation report evaluation. A report describing the actions taken to correct shortcomings identified in the attached final statement must be submitted to ABET by July 01, 2019. The reaccreditation evaluation will focus on these shortcomings. Please note that a visit is not required.
Introduction & Discussion of Statement Construct

The Engineering Accreditation Commission (EAC) of ABET has evaluated the aerospace, biomedical, chemical, civil, computer, electrical, industrial and systems, materials, mechanical and software engineering programs of San Jose State University.

This statement is the final summary of the EAC evaluation at the institutional and engineering-program levels. The statement consists of two parts: the first addresses the institution and its overall engineering educational unit, and the second addresses the individual engineering programs. It is constructed in a format that allows the reader to discern both the original visit findings and subsequent progress made during due process.

A program’s accreditation action is based upon the findings summarized in this statement. Actions depend on the program’s range of compliance or non-compliance with the criteria. This range can be construed from the following terminology:

- Deficiency: A deficiency indicates that a criterion, policy, or procedure is not satisfied. Therefore, the program is not in compliance with the criterion, policy, or procedure.

- Weakness: A weakness indicates that a program lacks the strength of compliance with a criterion, policy, or procedure to ensure that the quality of the program will not be compromised. Therefore, remedial action is required to strengthen compliance with the criterion, policy, or procedure prior to the next review.

- Concern: A concern indicates that a program currently satisfies a criterion, policy, or procedure; however, the potential exists for the situation to change such that the criterion, policy, or procedure may not be satisfied.
FINAL STATEMENT

Observation: An observation is a comment or suggestion that does not relate directly to the current accreditation action but is offered to assist the institution in its continuing efforts to improve its programs.

Information Received After the Visit

1. Seven-day response. Information was received in the seven-day response relative to the institutional summary, aerospace engineering, electrical engineering, industrial and systems engineering, and mechanical engineering programs.

2. 30-day due-process response. Information was received in the 30-day due-process response period relative to the aerospace, biomedical, chemical, civil, computer, electrical, industrial and systems, materials, mechanical, and software engineering programs.

3. Post 30-day due-process response. Information was received in the post 30-day due process period relative to the aerospace, biomedical, chemical, civil, computer, electrical, industrial and systems, materials, mechanical, and software engineering programs.

Institutional Summary

San Jose State University, founded in 1857, is a metropolitan university located in San Jose, California. One of the 23 campuses of the California State University system, the university is organized into seven colleges offering more than 65 areas of study with an additional 165 concentrations. In spring 2017, 29,200 students were enrolled in undergraduate, credit, and graduate programs, including 23,790 students at the undergraduate level. The Charles W. Davidson College of Engineering includes eight departments and one program, with 13 undergraduate engineering programs. In fall 2016, 7,185 students were enrolled in the college, including 4,757 undergraduate and 2,428 graduate students. The undergraduate student population is 83 percent male/17 percent female and 18 percent white/82 percent non-white. For the 2015-16 academic year, 1,261 undergraduate and 767 graduate degrees were awarded in the college. In spring 2017, the instructional faculty included 44 tenured, 26 probationary, and 191 temporary faculty members.
Institutional Strengths

1. The university has an exceptional commitment to students and their academic success. Among other initiatives, each college contains student success centers and academic support services. In the Davidson College of Engineering, current student success initiatives include: Cohort Scheduling/Guided Pathways program, MESA MEP and WIE programs, Engineering Fresh Residency, and the Global Technology Initiative. These investments demonstrate the institution's commitment to its students, mission, and goals. Student use of these services have impacted retention and graduation rates and created an environment where students feel valued and are enabled toward their success.
FINAL STATEMENT

SAN JOSE STATE UNIVERSITY

Mechanical Engineering
BS Program

Program Criteria for Mechanical and Similarly Named Engineering Programs

Introduction

The mechanical engineering BS program was established in 1958 and initially accredited in 1965. In fall 2017, the program had 598 full-time students, 118 part-time students, 10.5 full-time-equivalent faculty members, and 20 part-time faculty members. The program awarded 163 degrees in the 2015-16 academic year.

Program Strength

1. The program relies on experienced adjunct faculty members who are drawn from local area industries and government agencies. These valued faculty members provide an opportunity for students to gain insight into the engineering profession and enhance their overall undergraduate experience.

Program Deficiency

1. Accreditation Policy and Procedure Manual (APPM) Section 1.E.5.b.(1) of the APPM states that the instructional and learning environments are adequate and are safe for the intended purposes. The team observed the following issues related to laboratories that all students in the college have access to: in several locations egress locations were not properly marked; several egress routes were either totally or partially blocked; access to several eye wash stations and/or safety showers was impeded; signage outside laboratory doors describing hazards and required personal protective equipment for visitors, emergency personnel, and students was absent; and the location of equipment for spill remediation was not properly marked and, difficult to access due to items placed on top of the equipment. In addition, though safety instruction was given and quizzes administered to students, the team observed some students not wearing safety glasses when conducting activities involving potential hazards. As a result, the College of Engineering cannot ensure safety in their lab environments. Thus, the program is not in compliance with this policy.
FINAL STATEMENT

SAN JOSE STATE UNIVERSITY

- **30-day due-process response**: The EAC acknowledges receipt of documentation in response to this shortcoming. Materials indicate the program has: 1) posted appropriate signage around machines and equipment, implemented a safety binder in all labs that identify hazards, required use of personal protective equipment, and posted emergency contact information; 2) verified eye wash, hearing protection, and spill kit functionality in respective labs; 3) developed protocols and processes for assuring student training and safety; 4) had program facilities certified by the campus environmental, health, and safety office; 5) implemented departmental safety director meetings; and 6) corrected all identified facility access/egress issues. The program has demonstrated that facilities are safe for the intended purposes.

- The deficiency is resolved.

- **Post 30-day due process response**: The EAC acknowledges receipt of documentation including evidence on the college-level improvement of safety, notes from a Cal/OSHA meeting, with inspection results and status, and two college-level safety director meetings held in spring 2018. The safety director meetings, required of all program safety directors each semester, covered the chartering of the new college safety committee, hazard communications planning, student training, accident forms, lab director responsibilities, student safety violation policies, and many other topics. These data provide further evidence that the program has demonstrated that facilities are safe for the intended purposes, and thus in compliance with this policy.

- The deficiency remains resolved.

Program Concerns

1. **Criterion 6, Faculty**: This criterion requires the program to demonstrate that the faculty are of sufficient number and have competencies to cover all of the curricular areas of the program. The program reports that state resources are not adequate to cover desired levels of full-time, tenure-track faculty members. Thus, the mechanical engineering program relies on 20 lecturers, in addition to the 11 full-time faculty members to cover curricular areas. Although there has been a 50 percent growth in the student population over the past five years, the tenure-
track faculty numbers have been stable over the last two years and the part time lecturer support has decreased from 22 members the prior year. Although this criterion is met, future compliance is in jeopardy without commensurate growth in the faculty.

- **Seven-day response:** Information was received in the seven-day response indicating that tenure-track faculty in the program had increased from eight, full-time-equivalent faculty members in 2014-15 to 11.5 faculty members in 2017-18, with an additional faculty member projected to join the faculty in 2018-19.

- **30-day due-process response:** The EAC acknowledges receipt of documentation demonstrating that while enrollments have grown, the program’s student/faculty ratios have actually decreased since the peak three years ago. Over the past three years, tenure/tenure-track faculty members grew from eight to 11.5 and adjunct/part-time have grown from 15 to 25. In addition, the university has designed the program as a no-growth program and thus enrollment is expected to be flat in the foreseeable future. Lastly, the program gained approval to expand the size of the tenure/tenure track faculty by one for the fall semester of 2018.

- The concern is resolved.

- **Post 30-day due process response:** The EAC acknowledges receipt of documentation including two signed offer letters for new tenure-track assistant professors in the program to begin fall 2018. These hires increase the permanent faculty size and together with enrollment leveling, result in an adequate faculty size to deliver the curriculum.

- This concern remains resolved.

2. **Criterion 7. Facilities** This criterion requires that modern tools, equipment, computing resources, and laboratories are available, accessible, and systemically maintained and upgraded. The laboratory space for the mechanical engineering program exceeds 21,000 square feet; however, equipment maintenance and modernization has not been accomplished on a routine and proactive basis. While the current laboratories and equipment are adequate, maintenance and modernization of equipment in these laboratories is essential to providing
appropriate, hands-on education to the students. Thus, future compliance with this criterion may be in jeopardy.

- **Seven-day response**: Information was received in the seven-day response related to funding for instructional laboratory maintenance and upkeep; this information will be considered in due process.

- **30-day due-process response**: The EAC acknowledges receipt of documentation of plans to more actively manage instructional lab equipment by implementing a system to maintain equipment use and inspection logs, as well as a process for evaluating and prioritizing needs. The college has committed to providing funding for lab equipment replacement. In addition, the college will make money available from the program’s existing budget by supporting lab teaching assistant salaries, which currently consume the vast majority of the program lab budget. This will leave resources for equipment maintenance and replacement per the equipment plan. Although the plans have been developed, no evidence was presented that they have been implemented.

- The concern is resolved.

- **Post 30-day due process response**: The EAC acknowledges receipt of documentation providing evidence that equipment has been purchased and installed for the ME 106 and 120 courses. Personnel expenditures have been made to support the implementation of the new equipment including NI MyDAQ kits, Arduino microcontrollers, several new sensors types, oscilloscopes, multimeters and DMMs. This new equipment, together with the developed plan to manage equipment replacement, results in facilities with modern tools, equipment, computing resources, and laboratories that are available, accessible, and systematically maintained and upgraded.

- The concern remains resolved.
Appendix G - BSME Four-Year Plan

SAN JOSE STATE UNIVERSITY
Bachelor of Science Degree in
MECHANICAL ENGINEERING

<table>
<thead>
<tr>
<th>FRESHMAN YEAR</th>
<th>Fall</th>
<th>Units</th>
<th>Spring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 30, Calculus I</td>
<td>3</td>
<td>Math 31, Calculus II</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Chem 1A, General Chemistry</td>
<td>5</td>
<td>Physics 50, Mechanics</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Engr 10, Intro to Eng (GE Area E)</td>
<td>3</td>
<td>ME 30, Computer Applications</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>English 1A, Composition (GE Area A2)</td>
<td>3</td>
<td>Communications (GE Area A1)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ME 20, Design and Graphics</td>
<td>2</td>
<td>English 1B, Composition II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>16</td>
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</table>

<table>
<thead>
<tr>
<th>SOPHOMORE YEAR</th>
<th>Fall</th>
<th>Units</th>
<th>Spring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 32, Calculus III</td>
<td>3</td>
<td>Math 133A, Differential Equations</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MatE 25, Intro to Materials</td>
<td>3</td>
<td>CE 95, Statics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Phys 51, Electricity and Magnetism</td>
<td>4</td>
<td>Physics 52, Atomic, Heat and Light</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>GE (Areas C1, D2)/Am Studies 1A</td>
<td>6</td>
<td>GE (Areas C2, D3)/Am Studies 1B</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>16</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JUNIOR YEAR</th>
<th>Fall</th>
<th>Units</th>
<th>Spring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 112, Mechanics of Materials</td>
<td>3</td>
<td>ME 106, Fund. Mechatronics Eng.</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ME 101, Dynamics</td>
<td>3</td>
<td>ME 114, Heat Transfer</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ME 111, Fluid Mechanics</td>
<td>3</td>
<td>ME 130, Applied Engr Analysis</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ME 113, Thermodynamics</td>
<td>4</td>
<td>ME 41, Shop Safety</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>EE 98, Intro. to Circuit Analysis</td>
<td>3</td>
<td>ME 154, Mech. Engr. Design</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>17</td>
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<table>
<thead>
<tr>
<th>SENIOR YEAR</th>
<th>Fall</th>
<th>Units</th>
<th>Spring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Capstone Course (ME 157, 182, or 190)</td>
<td>3</td>
<td>ME 195B, Senior Design Project II</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>ME 115, Thermal Engineering Lab</td>
<td>1</td>
<td>ENGR 195B, (GE Area S/V)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>ME 120, Experimental Methods</td>
<td>2</td>
<td>Technical Electives</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>ME 147, Dyn Sys Vib &amp; Control</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ME 195A, Senior Design Project I</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGR 195A, (GE Area S/V)</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>Total</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

MINIMUM UNITS FOR GRADUATION: 120
Students must pass the placement tests to enroll in Math 30 and English 1A.
KIN and General Education requirements in Area A3 and all of Area B are waived or satisfied by the major.
AMS 1A, B cover GE Areas C1, C2, D1, D2, D3, and F; or choose D2/D3 courses that double count in F1-3.
A D1 course must be taken if AMS 1a, 1b is not chosen.
Students are encouraged to take the WST as soon as possible after completing Engl 1B.
Math and physics workshops (Math 30W, 31W, Phys 50W) are recommended but not required.
### Appendix H -- Example BSME Assessment Rubrics

Some assessment rubrics are used purely for assessment whereas others are also used for grading.

Rubric for assessing teamwork in design projects (ABET Outcome 5) – “PC” indicates the relevant performance criterion, as shown in Appendix 8f.

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Beginning</th>
<th>Developing</th>
<th>Accomplished</th>
<th>Exemplary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective Setting (PC 1)</td>
<td>Does no background research and/or analysis to inform goals and specifications.</td>
<td>Some background research and/or analysis done, but not thorough. Provides some insights into goals and specifications.</td>
<td>Does good background research and/or analysis and contributes a fair share to setting objectives and specifications.</td>
<td>Does extensive background research and/or analysis. Leads process of setting measurable objectives and specifications.</td>
</tr>
<tr>
<td>Scheduling and Assignments (PC 1)</td>
<td>Does not participate in project management</td>
<td>Helps define own tasks and schedule but does not help with team management as a whole.</td>
<td>Assists with assigning tasks and project scheduling for the whole team.</td>
<td>Takes leadership in assigning tasks and project scheduling.</td>
</tr>
<tr>
<td>Design decisions and innovation (PC 2)</td>
<td>Does not contribute to design decisions</td>
<td>Provides feedback on others' designs but makes few of their own</td>
<td>Regularly contributes to design decisions but may not be innovative</td>
<td>Makes major contributions to innovative design decisions</td>
</tr>
<tr>
<td>Punctuality (PC 2)</td>
<td>Does not complete team assignments</td>
<td>Completes most assignments late</td>
<td>Completes most assignments on time</td>
<td>Completes all assignments on time</td>
</tr>
<tr>
<td>Meeting participation (PC 2)</td>
<td>Skips many team meetings</td>
<td>Skips some team meetings and frequently late</td>
<td>Attends most team meetings and usually on time</td>
<td>Attends all team meetings and almost always on time</td>
</tr>
<tr>
<td>Attitude (PC 3)</td>
<td>Complains and/or argues with teammates frequently</td>
<td>Neutral</td>
<td>Generally has a good attitude about the project. Rarely argues or complains.</td>
<td>Provides a positive attitude. Helps resolve conflicts.</td>
</tr>
<tr>
<td>Listens to other teammates (PC 3)</td>
<td>Always talking and only supports his/her own ideas</td>
<td>Usually does most of the talking and pushes ideas with little consideration of others.</td>
<td>Listens to others' ideas but does not consider them as much as they/she should.</td>
<td>Listens to and considers others' ideas thoroughly.</td>
</tr>
<tr>
<td>Communication (PC 3)</td>
<td>Unprofessional communication; designs incomprehensible</td>
<td>Either written or oral communication poor, but not both.</td>
<td>Design drawings and both written and oral communication clear.</td>
<td>Excellent written and oral communication; explains designs clearly</td>
</tr>
</tbody>
</table>
Rubric for assessing design in ME 195b Senior Design Project II project reports (ABET Outcome 6) – Note that Performance Criterion #6 listed in Appendix 8f is evaluated using a different instrument. A different multi-page rubric is used for grading the reports – this one is just used for assessment.

<table>
<thead>
<tr>
<th>Rubric Description</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearly define problem statement (PC 1)</td>
<td>no problem statement</td>
<td>vague statement; no specifics</td>
<td>problem defined well, but standard of success unclear</td>
<td>problem defined well, standard of success could be sharper</td>
<td>clearly defined problem; standard of success measurable</td>
</tr>
<tr>
<td>Develop design specifications (PC 2)</td>
<td>specs missing</td>
<td>specs present but incomplete and not justified</td>
<td>specs mostly complete; only some justified</td>
<td>specs complete; most justified</td>
<td>specs complete; all justified</td>
</tr>
<tr>
<td>Generate several concepts and select best concept (PC 3)</td>
<td>only 1 concept presented</td>
<td>multiple concepts presented for a few design decisions; choices not well justified</td>
<td>multiple concepts presented for most major decisions; justification of choices incomplete</td>
<td>multiple concepts presented for all major decisions; justification present but could be stronger</td>
<td>multiple concepts presented for all major decisions; justification of all design decisions well supported</td>
</tr>
<tr>
<td>Perform engineering analysis (PC 3)</td>
<td>little to no analysis done</td>
<td>analysis done where applicable but incomplete</td>
<td>analysis done where applicable, bringing in previous coursework; could be more thorough</td>
<td>thorough analysis using modern tools and engt fundamentals where appropriate</td>
<td></td>
</tr>
<tr>
<td>Incorporate public health, safety, welfare and environmental concerns (PC 4)</td>
<td>not done</td>
<td>one only area covered; vague analysis</td>
<td>multiple areas covered; discussion has some specifics</td>
<td>multiple areas covered; has good specifics but no detailed analysis</td>
<td>multiple areas covered; thorough discussion that incorporates research (analysis or citations)</td>
</tr>
<tr>
<td>Develop a bill of materials with accurate costs within team budget (PC 5)</td>
<td>missing</td>
<td>more than 3 components missing or unrealistic costs</td>
<td>1-2 components missing; most choices reflect good economic decisions</td>
<td>all components present; a few components may not be justified economically</td>
<td>all components present; choices reflect good economic decisions based on team budget</td>
</tr>
</tbody>
</table>
Appendix I New ABET BSME Outcomes with Performance Criteria

The program has documented student outcomes that support the program educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7). The outcomes were developed by ABET and implemented in Fall 2017. Performance criteria were developed by the ME Department. We are in the process of developing assessment rubrics tied to individual performance criteria. Some have already been developed, but more are needed. The old student outcomes and performance criteria are given in the ABET report.

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
   1) Define and articulate a complex problem in engineering terms.
   2) Research and collect information pertaining to the problem.
   3) Select appropriate math, science, and engineering methods to solve the problem, and apply those methods to reach a solution.
   4) Evaluate the solution effectiveness and modify if needed.

2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
   1) Based on an identified need, define a problem statement in engineering terms.
   2) Develop design specifications (materials, geometry, operating parameters, etc.)
   3) Generate design concepts for a system, component or process and perform analysis and verification. Select the best design.
   4) Incorporate public health, safety, welfare, and environmental concerns in design decisions
   5) Perform a simple economic analysis of the design
   6) Evaluate global, cultural and social considerations in design and/or manufacturing

3. an ability to communicate effectively with a range of audiences
   1) Produce reports and presentations that use clear and correct language and terminology to describe context, methodology, results, and conclusions.
   2) Produce reports and presentations of appropriate length (time) and technical breadth and depth for a given audience and setting.
   3) Produce reports and presentations that use clear and effective visuals to supplement written or verbal descriptions.

4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
   1) Demonstrate knowledge of a professional code of ethics.
2) Describe and explain the ways in which the engineering profession and work products can impact society and the environment.

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

   1) Participate in project management, including establishing objectives (and specifications where applicable), assigning tasks to team members, developing a schedule, tracking progress, and adjusting the project schedule as needed to ensure completion.
   2) Participates fully in team work, meets commitments and due dates, and contributes quality work to the project.
   3) Treats all team members respectfully, communicates professionally and consistently, encourages and listens to ideas from all team members, and avoids and resolves conflicts when appropriate.

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

   1) Design an experiment to acquire data by determining the data to measure and formulating an experimental methodology.
   2) Select appropriate measurement equipment, perform calibration, and acquire measurements.
   3) Analyze the data, evaluate the accuracy of the results, and draw conclusions or make predictions.

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

   1) Demonstrate the ability to access and utilize information from external sources, including vetting sources for validity and synthesizing information from multiple sources.
   2) Learn to use CAD software and simulators (ANSYS, Solidworks, Matlab, etc.) and apply to solve engineering problems
Appendix J General Education Course Plans and Assessment

Part 1. Department Involvement in GE
The BSME program until recently required 132 units. Under President Qayoumi, that requirement was moved to 120. To assist in the reduction of units, the COE worked to develop a new SJSU Studies sequence for S and V. ME195A/B Senior Design Project I and II now satisfy GE areas S and V when taken with Engr 195A/B, leading to a reduction of four units. General Engineering is submitted a separate evaluation of Engr 195A/B.

While the initial motivation for these courses was to help us reduce units, we have seen curricular benefits to the students as well. Some students spend little time thinking about social and cultural effects of their chosen profession of engineering, and the assignments and related class presentations and discussions have helped to broaden students’ perspectives. We want students to understand that the work they do as engineers matters and has a major effect on people both here in the US and around the world.

The overall course structure is that a senior student registers for 1-unit Engr 195A and 3-unit ME 195A in the fall and Engr 195B and ME 195B in the spring. ME 195A and B are the mechanical engineering senior design sequence. These are culminating courses for the BSME degree where students work on a project in groups of approximately four for the entire year, applying what they have learned in prior engineering courses. The fall is devoted to project development, design, and analysis with the spring devoted to construction and testing. Many of the class periods are devoted to team meetings and presentations. The courses also include joint lectures among all the sections, typically held in the Engineering auditorium to accommodate the large number of students, that involve lecture and small group discussions around the topics of self, society, and equality in the US in ME 195A and culture, civilization, and global understanding in ME 195B.

Engr 195A and B include case study modules. Each module has specific deliverables including written materials and resource links, a set of discussion questions, and written assignments as well as the lectures. In addition, the themes for each module provide guidance for the students in writing their application papers in ME 195A/B. Each SLO is addressed both in Engr 195A/B and ME 195A/B, with ME 195A/B providing specific application to their major. Each semester the Engr 195A/B course coordinator, Dr. Pat Backer, has meetings with senior design faculty to work on course coordination and identify and address any room for improvement.

ME 195A and B have three individual writing assignments each that address SJSU Studies learning outcomes. Lectures and the assignment prompts relate to the specific S and V learning outcomes. We use common grading rubrics in Canvas that have elements tied to the outcomes across all five or six sections. Results are evaluated by the department chair each year with recommended improvements.
implemented in coordination with the course coordinator. Prompts for the writing assignments can be found in the attached syllabi.

The assessment schedules from Fall 2017 through Spring 2024 are also attached. We plan to continue the process of assessment and course improvement throughout the next program planning cycle.

Part II Continuing Certification and Assessment

a. Course Evaluation

Assessment results for Fall 2017 for Area S are shown in Table J.1. Results from 159 students spread across the five sections are included.

<table>
<thead>
<tr>
<th></th>
<th>SLO 1</th>
<th>SLO 2</th>
<th>SLO 3</th>
<th>SLO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Expectations</td>
<td>63</td>
<td>66</td>
<td>63</td>
<td>62</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>28</td>
<td>9</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>Does Not Meet Expectations</td>
<td>8</td>
<td>25</td>
<td>21</td>
<td>15</td>
</tr>
</tbody>
</table>

In Fall 2016, the average percentage of students who did not meet expectations over the four SLO’s was 23%. That has dropped to 17% in Fall 2017, probably due to a combination of clearer instructions and moving the related lectures to a more convenient time so fewer students skipped them.

Table J.2 shows assessment results for Area V from Spring 2018

<table>
<thead>
<tr>
<th></th>
<th>SLO 1</th>
<th>SLO 2</th>
<th>SLO 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Expectations</td>
<td>76</td>
<td>61</td>
<td>67</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>20</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td>Does Not Meet Expectations</td>
<td>3</td>
<td>25</td>
<td>7</td>
</tr>
</tbody>
</table>

In Spring 2017, the average percentage of students who did not meet expectations over the three SLO’s was 23%. That dropped to 12% in Spring 2018. Students continue to have the most problems with the
Assignment relating to SLO 2, although we saw an improvement from 46% to only 25% not meeting expectations, due to implemented improvements.

b. Implemented Improvements

Since ME 195A/B first included SJSU Studies coverage in 14-15, we have implemented several improvements.

1. In 14/15 and 15/16, we included only one individual writing assignment in each class which was augmented by some short quizzes and some group writing in the students’ final project reports. Assessment showed that some outcomes did not receive sufficient coverage, and typically only one student per team would write the relevant final report section. As a result in 16/17 we moved to three individual writing assignments per semester. We also added additional lecture topics addressing the SJSU Studies SLO’s to the courses at this time to give students the background they need to write their papers.

2. Assessment of 16/17 results showed that some students did not understand the depth and quality that we expected on the papers. We enhanced the writing prompts and added examples of good papers to the Canvas sites for student reference. We also moved the lectures to a more convenient time for the students, so fewer students skipped them in 17/18 compared to 16/17.

c. Future Plan for Course Modifications

We are happy with the improvements that we have seen over the last couple years although there certainly is room for improvement. To help more students meet expectations, we will provide more examples of good papers to students (to help them get an idea of the depth and level of discussion that we expect) and will continue to refine the prompts for the papers to prevent misconceptions. Assessment may show the need for other future improvements. We have also gotten more faculty involved with planning the GE lectures and assignments, with Dr. Raymond Yee taking over as course coordinator from Dr. Nicole Okamoto in Fall 2018.

Attachments

On the next pages, please find the following:

- General Education Assessment Schedule forms from August 2017. This schedule originally went through 2022. It has been updated (in italics) to go through the next program planning cycle in 2024.
- Syllabi for ME 195A (Fall 2017) and ME 195B (Spring 2018). Writing assignment prompts are included in the syllabi.
- Annual reports from 14/15, 15/16, 16/17 and 17/18.
**General Education Assessment Schedule**

**Area S: SELF, SOCIETY & EQUALITY IN THE U.S.**

Course Prefix and Number: _ME 195a_____  Course Title: __Senior Design Project I__

Course Coordinator: __Nicole Okamoto____  E-mail: __nicole.okamoto@sjsu.edu___

Submission Date: ___8/14/17________  College: ____Engineering________

End of next Program Planning cycle (Self Study due to Dean; see Program Planning) _Fall 2018; Fall 2014___

Instructions: Each GE assessment schedule must indicate the plan for assessing all GELOs during the program planning cycle (beginning with the AY of the last PP Self Study and concluding with the last full AY prior to the year in which the PP Self Study is due). Departments may assess any combinations of GELOs in a given year, but they must assess all GE area GELOs in a program review cycle. Some assessment of the course is required each academic year.

<table>
<thead>
<tr>
<th>GE Student Learning Objective</th>
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</tr>
</thead>
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<td>GELO 1: Students will be able to describe how identities (i.e. religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age) are shaped by cultural and societal influences within contexts of equality and inequality.</td>
<td>AY 17-18, 18-19, 22-23</td>
</tr>
<tr>
<td>GELO 2: Students will be able to describe historical, social, political, and economic processes producing diversity, equality, and structured inequalities in the U.S.</td>
<td>AY 17-18, 19-20, 23-24</td>
</tr>
<tr>
<td>GELO 3: Students will be able to describe social actions which have led to greater equality and social justice in the U.S. (i.e. religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age).</td>
<td>AY 17-18, 20-21</td>
</tr>
<tr>
<td>GELO 4: Students will be able to recognize and appreciate constructive interactions between people from different cultural, racial, and ethnic groups within the U.S.</td>
<td>AY 17-18, 21-22</td>
</tr>
<tr>
<td>Other: (optional; e.g. diversity, writing)</td>
<td></td>
</tr>
</tbody>
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*Mechanical Engineering BSME Program Planning Report – Fall 2018*
### General Education Assessment Schedule

**Area V: CULTURE, CIVILIZATION, & GLOBAL UNDERSTANDING**

Course Prefix and Number: __ME 195b___  
Course Title: __Senior Design Project II__  
Course Coordinator: ___Nicole Okamoto__  
E-mail: __nicole.okamoto@sjsu.edu__  
Submission Date: __8/15/17_____  
College: ____Engineering____________

End of next Program Planning cycle (Self Study due to Dean; see [Program Planning](#)) _Fall 2018; Fall 2024_

Instructions: Each GE assessment schedule must indicate the plan for assessing all GELOs during the program planning cycle (beginning with the AY of the last PP Self Study and concluding with the last full AY prior to the year in which the PP Self Study is due). Departments may assess any combinations of GELOs in a given year, but they must assess all GE area GELOs in a program review cycle. Some assessment of the course is required each academic year.

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<td>GELO 2: Students shall be able to identify the historical context of ideas and cultural traditions outside the U.S. and how they have influenced American culture.</td>
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<td>GELO 3: Students shall be able to explain how a culture outside the U.S. has changed in response to internal and external pressures.</td>
<td>AY 17-18, 20-21</td>
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Other: (optional; e.g. diversity, writing)
San José State University

Mechanical Engineering Department
ME 195A, Senior Design Projects, Section 1, Fall 2017

Course and Contact Information

Instructors:
Section 1: Prof. Raghu Agarwal, Room E135
Section 2: Prof. Raymond Yee, Room E111
Section 3: Prof. Winncy Du, Room E192
Section 4: Prof. Furman, 128 E. John St (between 3rd and 4th Streets)
Section 5a (48864) Prof. Mokri, Room E141
Section 5b (50352) Prof. Zaidi, Room E133

Contact Information:
Dr. Agarwal: office Engr 310D, raghu.agarwal@sjsu.edu, (408) 924-3845
Dr. Yee: office Engr 310E, raymond.yee@sjsu.edu, (408) 924-3935
Dr. Du: office Engr 310F, winncy.du@sjsu.edu, (408) 924-3866
Dr. Furman: office Engr 310G, burfurd.furman@sjsu.edu, (408) 924-3817
Dr. Zaidi: sohailzaidi@gmail.com
Prof. Mokri: james.mokri@sjsu.edu

Office Hours:
Dr. Agarwal: TR 4:30-6:00
Dr. Yee: M 2-3, T 11-12
Dr. Du: MW 12-1:15
Dr. Furman: MW 12-1:15
Dr. Zaidi: R 4-6 pm in Engr 133
Prof. Mokri: W 9-10, 4:30-5:30 in Engr 113

Class Days/Time: Wednesday, 1:30-4:15 pm

Prerequisites:
ME 114, ME 154 and ENGR 100W (with grade C- or better in each)
ME 195A&B sequence must be completed in the same academic year

GE/SJSU Studies Category: S

SJSU Studies Policies
To receive credit for SJSU Studies Areas S and V, students must complete both Engr 195A and Engr 195B, each with a grade of C or better. In addition, they must complete their senior project course sequence and earn a grade of C or better in each course (ME 195A and ME 195B).

Students are strongly encouraged to satisfy GE Areas R,S, and V with courses from departments other than the major department. Completion of, or co-registration in, a 100W course is strongly recommended. A minimum aggregate GPA of 2.0 of 2.0 in GE Areas R, S, and V shall be required of all students.
Course Format

Technology Intensive, Hybrid, and Online Courses
This class requires the use of Canvas, so you will need access to the internet. Most, if not all, assignments during the semester will require the use of a computer for word processing, spreadsheets, computational analysis, CAD drawings, etc. Electronic communication with your instructor and teammates is also required.

Faculty Web Page and MYSJSU Messaging
Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the ME 195 web page and/or on Canvas Learning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking your email to learn of any updates.

Course Description
First half of a one-year team project carried out under faculty supervisions. Project will proceed from problem definition to analysis, design and validation, experimentation including possible construction and testing.

Course Goals
The overall goals for the course are to:

1. Provide senior students a capstone experience in design from concept to fabrication and validation of the final product.
2. Familiarize students with general industry practices, such as planning, scheduling, budgeting, part procurement, fabrication, assembly, and functional tests.
3. Develop students’ creative abilities in solving open-ended design problems.
4. Develop students’ engineering judgment as well as their confidence in making and accepting responsibility for design decisions.
5. Develop students’ oral and written communication skills necessary to describe the assumptions, methods, and results of engineering analysis, synthesis, and decision making associated with their design.
6. Make students aware of the importance of teamwork in the design of products and provide them with an opportunity to develop team and leadership skills.
7. Develop students’ understanding of professional practices, as well as global, environmental, and societal issues relevant to mechanical engineering.

GE Learning Outcomes (GELO)
Upon successful completion of this course, students will be able to:
1. Describe how identities (i.e. religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age) are shaped by cultural and societal influences within contexts of equality and inequality.
2. Describe historical, social, political, and economic processes producing diversity, equality, and structured inequalities in the U.S.
3. Describe social actions which have led to greater equality and social justice in the U.S. (i.e. religious, gender, ethnic, racial, class, sexual orientation, disability, and/or age).
4. Recognize and appreciate constructive interactions between people from different cultural, racial, and ethnic groups within the U.S.
Course Learning Outcomes (CLO)

By the end of the course each student should be able to:

*Design Skills*

1. Apply the complete product development process including:
   a) Defining the problem/societal need, carrying out market study/economic and budget analyses
   b) Developing a complete set of functional specifications the design solution must meet
   c) Generating solution concepts
   d) Selecting the most promising design concept using structured methodologies
   e) Developing design models and/or drawings for prototype and final design components
   f) Procuring, fabricating, and assembling prototype and final design hardware
   g) Evaluating, testing, and analyzing prototype and final design components and systems
   h) Identifying future modifications and improvements that could be made to the design based on test data
   i) Writing a project report and making presentations

2. Develop a schedule, and meet schedule and budget constraints.

3. Interact effectively with vendors, suppliers, and shop personnel.

*Communication Skills*

4. Write high quality design reports (i.e., using correct language and terminology, correct technical information, and professionally prepared graphs and tables).

5. Give clear, informative, technically correct oral presentations using professionally prepared visual aids.

*Team Skills*

6. Work harmoniously and effectively on a team to complete a design project.

*Self, Society, and Equality in the US*

7. Describe how his or her identity and social interactions have been shaped by mobile technology (GELO 1)

Assignment: Write a short essay (600 word minimum) that addresses the following issues:

a) Describe the effect that mobile technology has had on your interactions with people around you. In particular, think about how your identity has been shaped by mobile technology. (GELO 1)

b) Describe how mobile technology (which can be via social media) can promote constructive interactions between people from different cultural, racial, and ethnic groups within the U.S., OR how mobile technology widens the divide between from different cultural, racial, and ethnic groups within the U.S. (GELO 4)

Item ii should be researched, but item I should be based on your own experiences.

8. Analyze how his or her engineering projects can produce diversity, equality, and structured inequalities in the U.S. (GELO 2)

Assignment: Address how your project may affect society--locally and/or globally--if implemented and how human behavior will affect the success of your design. Address how your project may lead to greater equality and social justice in the US, if at all.

The following are a list of questions to help you start thinking about this analysis. Not all questions will apply to all projects, and this list is not necessarily comprehensive.
a) What global, social or cultural influences have led to a need for your project? (Everyone should be able to address this question.)
b) If implemented on a wide scale, how will your project result in greater equality and social justice?
c) How will your design help create an even playing field for underprivileged people?
d) What human, social, and cultural barriers may result in difficulties implementing your project?
e) How may society’s perception of your project result in difficulties during implementation?
f) What may be the environmental impact of your project over its life cycle?
g) What may be the effect on public health or society? How will your project affect quality of life?

You need to write enough to do a thorough job, but the minimum requirement is 600 words.

9. Discuss how technology helps to promote greater equality and social justice in the U.S. among the disabled. (GELO 3)

Assignment: Choose one technology related to mechanical engineering not mentioned in any of these videos that helps the disabled. Write a minimum 300-word essay presenting the technology. Discuss how this technology helps to promote greater equality and social justice in the U.S. among the disabled. Cite any references (at least two).

10. Describe how mobile technology can promote constructive interactions between people from different cultural, racial, and ethnic groups within the U.S., OR how mobile technology widens the divide between from different cultural, racial, and ethnic groups within the U.S (GELO 4)

See CLO 7 above for the related assignment.

Required Texts/Readings

Textbook
None

Other Readings
Links to additional online readings will be posted online.

Course Requirements and Assignments

ME 195A involves heavy team participation. You’ll be working with your team to define your project and its specifications and go through the phases of design. Successfully completing ME 195B means that you need to have a complete, optimized design at the end of ME 195A. Scheduling and spreading out your work evenly throughout the semester is a very important. You must attend all Wednesday sessions. Assignments are described on the next page.

Proposal and Progress Reports

The project proposal outlines the deliverables and specifications for your project. Follow the guidelines on the ME 195 website unless otherwise noted by your instructor. Progress reports may be required by individual instructors, and they will provide you with information about required format and due dates.
**Presentations**

Three group presentations are scheduled throughout the semester. All team members must present and be prepared to answer questions. Guidelines are shown on the ME 195 website.

**Individual Writing Assignments**

These are assignments based on the Friday sessions that are joint with Engr 195A. They are required of all students in ME 195A. Note that each assignment is worth 5% of your total grade, so put good effort into these papers. Assignment details are posted on Canvas. Students are encouraged to take a look at good example papers from last year as well as the grading rubric before beginning writing. Assignments must be submitted via Canvas. “Turnitin.com” will be used to check for plagiarism.

**Professional Modules**

Two professional modules that must be completed using Canvas will be required. One will cover team setup and conflict resolution and the other will cover searching for a job. You will not be graded on these modules, but you will need to complete them to pass the class. Do not leave them for the end of the semester when things get busy. This is the first semester that we’re including these modules, so we will be contacting you for feedback after the semester concludes.

**Final report (Final Evaluation)**

Unless otherwise noted by your instructor, the final report should follow the format included in the “ME 195B Final Report Evaluation Rubric” shown on the course website. ME 195A reports typically go through Chapter 4. Consult your instructor to see which sections he or she wants you to complete. The final report serves as your final evaluation for the course, per university policy.

**Individual Performance Evaluation**

Your instructor will give you a score for your individual team contributions. Items that factor into this score may include team meeting participation, performance in presentations, individual contributions to the final report, and an individual performance evaluation form that each team member must complete. Your instructor will let you know which form to complete.

**Expected time commitment**

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

**Grading Information**

A letter grade will be assigned to each student by the section instructor at the end of the semester and will be based on evaluation of the following course requirements:

(5%) Project proposal and progress reports
(25%) Delivery of at least three presentations on achievements and timely progress
(15%) Individual writing assignments
(40%) Final report
(15%) Individual performance evaluation
Grade Distribution

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92.9</td>
</tr>
<tr>
<td>B+</td>
<td>87-89.9</td>
</tr>
<tr>
<td>B</td>
<td>83-86.9</td>
</tr>
<tr>
<td>B-</td>
<td>80-82.9</td>
</tr>
<tr>
<td>C+</td>
<td>77-79.9</td>
</tr>
<tr>
<td>C</td>
<td>73-76.9</td>
</tr>
<tr>
<td>C-</td>
<td>70-72.9</td>
</tr>
<tr>
<td>D+</td>
<td>67-69.9</td>
</tr>
<tr>
<td>D</td>
<td>63-69.9</td>
</tr>
<tr>
<td>D-</td>
<td>60-62.9</td>
</tr>
</tbody>
</table>

Notes about Grading:

1. No extra credit will be made available.
2. No late work will be accepted except for the final report, which will be penalized by one letter grade per day.
3. Two professional modules that can be found in Canvas are also required. They do not factor into the course grade but must be passed to pass the class. You may retake the quiz related to the modules as many times necessary to pass them.

Classroom Protocol

It is expected that each team member will be present in class each week, working with his or her team. Missing or coming late to team meetings without an approved excuse will result in lower grades on the individual performance evaluation. Each team member must participate in each oral presentation or else he/she will receive a grade of “0” for that presentation. The only exceptions are university-authorized excuses, such as being ill with a note from a doctor, or if arrangements were made in advance with the instructor.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs’ Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/’”
# ME 195A Senior Design Project 1 Course Schedule, Fall 2017

Schedule is subject to change with fair notice via email. Assignments are due by 11:59 pm unless otherwise noted.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Deadlines</th>
<th>Assignments Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 23</td>
<td>General session on overview of ME 195 and project topics in Engr 189. Subsequent meeting with individual section instructors.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Aug 30</td>
<td>Individual sessions on project descriptions and team organization</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sept 6</td>
<td>Individual sessions on project proposals</td>
<td>Proposal due 9/8</td>
</tr>
<tr>
<td>4</td>
<td>Sept 13</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Sept 20</td>
<td>Project oral presentation #1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fri, Sept 22</td>
<td>Seminar: Impact of Technology on Society in Engr 189</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Sept 27</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Oct 4</td>
<td>Seminar: Project Report Preparation, location TBD</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Oct 11</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Oct 18</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fri, Oct 20</td>
<td>Seminar: Effect of Mobile Technology on Society in Engr 189</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Oct 25</td>
<td>Project oral presentation #2</td>
<td>Indiv. Writing Assignment 1 due 9/29</td>
</tr>
<tr>
<td>11</td>
<td>Nov 1</td>
<td>Individual sessions</td>
<td>Indiv. Writing Assignment 2 due 10/27</td>
</tr>
<tr>
<td>12</td>
<td>Nov 8</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Nov 15</td>
<td>Individual sessions – planning for final report</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Nov 22</td>
<td>Non-instructional day (campus open, but no class)</td>
<td></td>
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<tr>
<td>15</td>
<td>Nov 29</td>
<td>Oral presentation #3</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Fri, Dec 1</td>
<td>Online module due -- Use of Technology to Aid the Disabled</td>
<td>Indiv. Writing Assignment 2 due 12/1</td>
</tr>
<tr>
<td>16</td>
<td>Dec 6</td>
<td>Individual sessions – final report work plus planning for spring</td>
<td>Online professional modules due</td>
</tr>
<tr>
<td>Final Exam Period</td>
<td>12/18 at 12:15</td>
<td>Final project report and individual performance evaluation forms due at 12:15</td>
<td></td>
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San José State University

Mechanical Engineering Department
ME 195B, Senior Design Projects, Spring 2018

Course and Contact Information

Instructors:  
Section 1: Prof. Raghu Agarwal, Room E135  
Section 2: Prof. Raymond Yee, Room E111  
Section 3: Prof. Winncy Du, Room E192  
Section 4: Prof. Furman, 128 E. John St (between 3rd and 4th Streets)  
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Dr. Furman: office Engr 310G, burfurd.furman@sjtu.edu, (408) 924-3817  
Dr. Zaidi: sohailzaidi@gmail.com, (609) 558-1227  
Prof. Mokri: james.mokri@sjtu.edu

Office Hours:  
Dr. Agarwal: TR 4:30-6:00  
Dr. Yee: M 2-3, T 11-12  
Dr. Du: MW 12-1:15  
Dr. Furman: MW 12-1:15  
Dr. Zaidi: R 4-6 pm in Engr 133  
Prof. Mokri: W 9-10, 4:30-5:30 in Engr 113

Class Days/Time:  
Wednesday, 1:30-4:15 pm

Prerequisites:  
ME 195A with a C- or better  
ME 195A&B sequence must be completed in the same academic year

GE/SJSU Studies Category:  
V

SJSU Studies Policies

To receive credit for SJSU Studies Areas S and V, students must complete both ENGR 195A and ENGR 195B, each with a grade of C or better. In addition, they must complete their senior project course sequence and earn a grade of C or better in each course (ME 195A and ME 195B).

Students are strongly encouraged to satisfy GE Areas R, S, and V with courses from departments other than the major department. Completion of , or co-registration in, a 100W course is strongly recommended. A minimum aggregate GPA of 2.0 of 2.0 in GE Areas R, S, and V shall be required of all students.
Course Format

Technology Intensive, Hybrid, and Online Courses
This class requires the use of Canvas, so you will need access to the internet. Most, if not all, assignments during the semester will require the use of a computer for word processing, spreadsheets, computational analysis, CAD drawings, etc. Electronic communication with your instructor and teammates is also required.

Faculty Web Page and MYSJSU Messaging
Course materials such as syllabus, handouts, notes, assignment instructions, etc. can be found on the ME 195 web page and/or on Canvas Learning Management System course login website at http://sjsu.instructure.com. You are responsible for regularly checking your email to learn of any updates.

Course Description
Continuation of ME 195A. Culmination of project requiring a formal report consisting of documentation of project results and oral presentation.

Course Goals
The overall goals for the course are to:
1. Provide senior students a capstone experience in design from concept to fabrication and validation of the final product.
2. Familiarize students with general industry practices, such as planning, scheduling, budgeting, part procurement, fabrication, assembly, and functional tests.
3. Develop students’ creative abilities in solving open-ended design problems.
4. Develop students’ engineering judgment as well as their confidence in making and accepting responsibility for design decisions.
5. Develop students’ oral and written communication skills necessary to describe the assumptions, methods, and results of engineering analysis, synthesis, and decision making associated with their design.
6. Make students aware of the importance of teamwork in the design of products and provide them with an opportunity to develop team and leadership skills.
7. Develop students’ understanding of professional practices, as well as global, environmental, and societal issues relevant to mechanical engineering.

GE Learning Outcomes (GELO)
Upon successful completion of this course, students will be able to:
1. Compare systematically the ideas, values, images, cultural artifacts, economic structures, technological developments, or attitudes of people from more than one culture outside the U.S.
2. Identify the historical context of ideas and cultural traditions outside the U.S. and how they have influenced American culture.
3. Explain how a culture outside the U.S. has changed in response to internal and external pressures.

Course Learning Outcomes (CLO)
By the end of the course each student should be able to:

Design Skills
1. Apply the complete product development process including:
   j) Defining the problem/societal need, carrying out market study/economic and budget analyses
   k) Developing a complete set of functional specifications the design solution must meet
   l) Generating solution concepts
   m) Selecting the most promising design concept using structured methodologies
   n) Developing design models and/or drawings for prototype and final design components
   o) Procuring, fabricating, and assembling prototype and final design hardware
   p) Evaluating, testing, and analyzing prototype and final design components and systems
   q) Identifying future modifications and improvements that could be made to the design based on test data
   r) Writing a project report and making presentations

2. Develop a schedule, and meet schedule and budget constraints.

3. Interact effectively with vendors, suppliers, and shop personnel.

Communication Skills

4. Write high quality design reports (i.e., using correct language and terminology, correct technical information, and professionally prepared graphs and tables).

5. Give clear, informative, technically correct oral presentations using professionally prepared visual aids.

Team Skills

6. Work harmoniously and effectively on a team to complete a design project.

Environmental, Economic, Ethical, and Safety Issues

7. Evaluate and describe accurately the environmental impact of your product.

8. Evaluate and describe accurately any environmental, health, safety, and economic tradeoffs of your product.

9. Analyze how NSPE codes of ethics apply to engineering projects

Culture, Civilization, and Global Understanding

10. Analyze changes in design, manufacturing, and/or cost for production in different countries (GELO 1)
    Assignment: Assume that your senior design project (or choose a project related to your senior design project) is going to be manufactured in another country. Using the studies provided in Engr 195a/b as a background, write about one of the topics below, and compare it for two countries outside of the United States with very different cultures. Back up your claims with research, and cite at least two sources. Minimum word count: 800
    a. How would you recommend changing your design, if your project were to be implemented in these countries? For example, if you implemented your design in China, would the different social and cultural norms necessitate changes to the final design?
    b. What human, social, and cultural barriers may result in difficulties implementing your project?
    c. How would these different cultures change the manufacturing process and cost? Discuss multiple effects. For example, different countries have different costs of living, union involvement, safety regulations, management styles, etc. Discuss the cultural effects that result in these differences.

11. Describe cultural and social factors that lead to technological inventions and how the inventions influenced American culture. (GELO 2)
Assignment: Consider a technology in the Mechanical Engineering field invented outside of the U.S. (a) Describe the cultural and social factors that led to this technology’s invention. (b) Describe how this invention has evolved and influenced the culture of the U.S. You must include at least two references. Minimum word count: 300

12. Evaluate cultural and social factors that have led to major renewable energy projects (GELO 3)

Assignment: Research one of the following renewable energy projects: Narmada Dam (India), 3 Gorges Dam (China), Nam Theun-Hinboun Hydropower (Laos). Describe the cultural and social factors that led to these projects. Describe how these project have evolved and influenced the culture of the country where they are located. If you were working on one of these projects and were a member of the National Society of Professional Engineers, what aspects of their codes of ethics would affect your work? In what way? Minimum word count: 400

Required Texts/Readings

Textbook
None

Other Readings
Links to additional online readings will be posted online.

Course Requirements and Assignments

ME 195B involves heavy team participation and good scheduling. You will be building and testing your prototypes. Most prototypes do not work properly at first and require some re-design and re-building. Plan for that in your schedule. Also, work on your reports throughout the semester, and document well as you build. Do not wait to start your final report until after Student Conference Day! You must attend all Wednesday sessions. Assignments are described in the following sections.

Presentations

Three group presentations are scheduled throughout the semester. All team members must present and be prepared to answer questions. Guidelines are shown on the ME 195 website. The final presentation (Student Conference Day) is scheduled for the last Friday of the regular semester. This session involves a formal presentation that is open to the public.

Individual Writing Assignments

These are assignments based on the Friday sessions that are joint with ENGR 195B. They are required of all students in ME 195B. Note that each assignment is worth 5% of your total grade, so put good effort into these papers. Assignment details are posted on Canvas. Students are encouraged to take a look at good example papers from last year as well as the grading rubric before beginning writing. Assignments must be submitted via Canvas. “Turnitin.com” will be used to check for plagiarism.

Professional Modules

Two professional modules that must be completed using Canvas will be required. You will not be graded on these modules, but you will need to complete them to pass the class. Do not leave them for the end of the semester when things get busy. This is the first semester that we’re including these modules, so we will be contacting you for feedback after the semester concludes.
Prototype

Each team is expected to demonstrate a working prototype of their project to its instructor. The evaluation rubric is available on the ME 195 website.

Final report (Final Evaluation)

Unless otherwise noted by your instructor, the final report should follow the format included in the “ME 195B Final Report Evaluation Rubric” shown on the course website. The final report serves as your final evaluation for the course, per university policy.

Individual Performance Evaluation

Your instructor will give you a score for your individual team contributions. Items that factor into this score may include team meeting participation, progress reports, performance in presentations, individual contributions to the final report, and an individual performance evaluation form that each team member must complete. Your instructor will let you know which form to complete.

Expected time commitment

Success in this course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction or preparation/studying or course related activities including but not limited to internships, labs, clinical practica. Other course structures will have equivalent workload expectations as described in the syllabus.

E123 Shop Access

The shop in E123 will be made available for students for fabrication purposes during the hours posted on the door. Access beyond those hours for assembly purposes only (no machining) will be granted on a case-by-case basis by petition. Access to the shop will be given under two circumstances: 1) you have taken ME/Tech 41 and received a B- or better, or 2) you can demonstrate the ability to run the machinery safely. In either case, you are also required to pass Canvas quizzes on safe shop procedures. Please see the department office for forms to request access. Violating the safety rules of the shop, such as working alone, will result in immediate and permanent loss of access to the shop.

Safety

Do NOT leave trash in the area. Hazardous materials are to be kept in safe containers.
Do NOT leave equipment running unattended.

NO STUDENT IS PERMITTED TO WORK ALONE IN A WORK AREA WITH EQUIPMENT OR HAZARDOUS MATERIAL PRESENT. Refer to the Safety Rules in your manual and posted in each Laboratory.

Grading Information

A letter grade will be assigned to each student by the section instructor at the end of the semester and will be based on evaluation of the following course requirements:

(25%) Delivery of at least three presentations on achievements and timely progress
(15%) Individual writing assignments
(45%) Final report and prototype
(15%) Individual performance evaluation
Grade Distribution

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>93-100</td>
</tr>
<tr>
<td>A-</td>
<td>90-92.9</td>
</tr>
<tr>
<td>B+</td>
<td>87-89.9</td>
</tr>
<tr>
<td>B</td>
<td>83-86.9</td>
</tr>
<tr>
<td>B-</td>
<td>80-82.9</td>
</tr>
<tr>
<td>C+</td>
<td>77-79.9</td>
</tr>
<tr>
<td>C</td>
<td>73-76.9</td>
</tr>
<tr>
<td>C-</td>
<td>70-72.9</td>
</tr>
<tr>
<td>D+</td>
<td>67-69.9</td>
</tr>
<tr>
<td>D</td>
<td>63-69.9</td>
</tr>
<tr>
<td>D-</td>
<td>60-62.9</td>
</tr>
</tbody>
</table>

Notes about Grading:

4. No extra credit will be made available.
5. No late work will be accepted except for the final report, which will be penalized by one letter grade per day.
6. Two professional modules that can be found in Canvas are also required. They do not factor into the course grade but must be passed to pass the class. You may retake the quiz related to the modules as many times necessary to pass them.

Classroom Protocol

It is expected that each team member will be present in class each week, working with his or her team. Missing or coming late to team meetings without an approved excuse will result in lower grades on the individual performance evaluation. Each team member must participate in each oral presentation or else he/she will receive a grade of “0” for that presentation. The only exceptions are university-authorized excuses, such as being ill with a note from a doctor, or if arrangements were made in advance with the instructor.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs’ Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/”
# ME 195B Senior Design Project 1I Course Schedule, Spring 2018

*Schedule is subject to change with fair notice via email. Assignments are due by 11:59 pm.*

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topics, Readings, Assignments, Deadlines</th>
<th>Assignments Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jan 24</td>
<td>General session in Engr 189. Subsequent meeting with individual section instructors</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Jan 31</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Feb 7</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Feb 14</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Feb 21</td>
<td>Project oral presentation #1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fri, Feb 23</td>
<td>Seminar: Global Economy and Social Impacts in Engr 189</td>
<td>Indiv. Writing Assignment 1 due 3/2</td>
</tr>
<tr>
<td>6</td>
<td>Feb 28</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>March 7</td>
<td>Instructor’s Meeting followed by Individual Sessions</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>March 14</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Fri, March 16</td>
<td>Engineering Ethics Case Studies</td>
<td>Indiv. Writing Assignment 2 due 3/23</td>
</tr>
<tr>
<td>9</td>
<td>March 21</td>
<td>Individual Sessions</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>April 4</td>
<td>Project oral presentation #2</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>April 11</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>April 18</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>April 25</td>
<td>Individual sessions – planning for final report</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>May 3</td>
<td>Individual sessions</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Fri, May 5</td>
<td>Online module due -- ME Inventions that Have Changed Society</td>
<td>Indiv. Writing Assignment 3 due</td>
</tr>
<tr>
<td>15</td>
<td>May 9</td>
<td>Prototype Demonstrations</td>
<td>Online professional modules due</td>
</tr>
<tr>
<td>16</td>
<td>Fri, May 11</td>
<td>Student Conference Day – Final public oral presentations</td>
<td></td>
</tr>
<tr>
<td>Final Exam Period</td>
<td>TBD</td>
<td>Final report and individual evaluation forms due at beginning of final exam period</td>
<td></td>
</tr>
</tbody>
</table>
General Education Annual Course Assessment Form

Course Number/Title __ME 195a___ GE Area: approved for S when combined with Engr 195a

Results reported for AY __17-18_______ # of sections ____5_____ # of instructors ____6______

Course Coordinator: ___Nicole Okamoto_____ E-mail: __nicole.okamoto@sjsu.edu____

Department Chair: ___Nicole Okamoto____ College: _____Engineering________

Part 1

(1) What SLO(s) were assessed for the course during the AY? All SLO’s for S were assessed (Area S SLO’s 1-4). Additional assessment was performed in Engr 195a.

(2) What were the results of the assessment of this course? What were the lessons learned from the assessment?

SLO’s were assessed based on three individual writing assignments. Results are shown in Table 1. Writing assignments were assessed using common grading rubrics for all five sections and common graders. Results from approximately 150 students spread across the five sections are included.

Table 1 Student Achievement of Area S SLO’s in ME 195a

<table>
<thead>
<tr>
<th></th>
<th>SLO 1</th>
<th>SLO 2</th>
<th>SLO 3</th>
<th>SLO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Expectations</td>
<td>63</td>
<td>66</td>
<td>63</td>
<td>62</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>28</td>
<td>9</td>
<td>16</td>
<td>23</td>
</tr>
<tr>
<td>Does Not Meet Expectations</td>
<td>8</td>
<td>25</td>
<td>21</td>
<td>15</td>
</tr>
</tbody>
</table>

All assignments showed the link between the SJSU Studies SLO’s and engineering. Some students spend little time thinking about social and cultural effects of engineering, and the assignments and related class presentations and discussions have helped to broaden students’ perspectives. In Fall 2016, the average percentage of students who did not meet expectations over the four SLO’s was 23%. That has dropped to 17% in Fall 2017, probably due to a combination of clearer instructions and moving the related lectures to a more convenient time so fewer students skipped them.

(3) What modifications to the course, or its assessment activities or schedule, are planned for the upcoming year? (If no modifications are planned, the course coordinator should indicate this.)

No changes are planned except that there will be a new course coordinator, Dr. Raymond Yee.

Part 2

(4) Are all sections of the course still aligned with the area Goals, Student Learning Objectives (SLOs), Content, Support, and Assessment? If they are not, what actions are planned? Yes
(5) If this course is in a GE Area with a stated enrollment limit, please indicate how or how practice and revisions in writing will be addressed with larger sections, particularly how students are receiving thorough feedback on the writing which accounts for the minimum word count in this GE category.

All sections except one were within enrollment limits of 40 students. The remaining section had 45. However, in practice that section was composed of two smaller sections. The section was team-taught, and each instructor ran his section as an independent section (We set the section up as team-taught rather than setting up two separate sections because of faculty appointment issues.).

Graders with backgrounds in the humanities were hired by the dean’s office to do all grading. All assignments were graded using detailed rubrics that were common to all sections with certain rubric elements linked to outcomes in Canvas. Additional student feedback was provided via comments posted in Speedgrader. Students were allowed to revise and resubmit assignments to improve their grades once per assignment. Assignments with major grammar problems were not graded – they were returned to students to revise and resubmit.
General Education Annual Course Assessment Form

Course Number/Title __ME 195b___ GE Area: approved for V when combined with Engr 195b
Results reported for AY __17-18________ # of sections ____5_____ # of instructors ____6_____

Course Coordinator: __Nicole Okamoto_____ E-mail: __nicole.okamoto@sjsu.edu____
Department Chair: ___Nicole Okamoto____ College: _____Engineering________

Part 1

(1) What SLO(s) were assessed for the course during the AY? All three SLO’s were assessed. Additional assessment was performed in Engr 195b.

(2) What were the results of the assessment of this course? What were the lessons learned from the assessment?

SLO’s were assessed based on three individual writing assignments, and results are presented in Table 1. This is an increase from one assignment in year 15-16. Writing assignments were assessed using common grading rubrics for all five sections and common graders. Results from all 158 students spread across the five sections are included. Lessons learned are discussed under (3).

<table>
<thead>
<tr>
<th></th>
<th>SLO 1</th>
<th>SLO 2</th>
<th>SLO 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Expectations</td>
<td>76</td>
<td>61</td>
<td>67</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>20</td>
<td>14</td>
<td>26</td>
</tr>
<tr>
<td>Does Not Meet Expectations</td>
<td>3</td>
<td>25</td>
<td>7</td>
</tr>
</tbody>
</table>

All assignments show students the link between the SJSU Studies SLO’s and engineering. Engineering students understand that they work in a global community but don’t always have the background to understand the implications for their work. These assignments helped students to expand that understanding.

In Spring 2017, the average percentage of students who did not meet expectations over the three SLO’s was 23%. That has dropped to 12% in Spring 2018. Students continue to have the most problems with the assignment relating to SLO 2, although we saw an improvement from 46% to only 25% not meeting expectations, due to implemented improvements discussed in last year’s assessment report.

(3) What modifications to the course, or its assessment activities or schedule, are planned for the upcoming year? (If no modifications are planned, the course coordinator should indicate
We will have a new course coordinator, Dr. Raymond Yee. Samples of good assignments related to SLO 2 will be placed on the Canvas site and assignment instructions clarified.

Part 2

(4) Are all sections of the course still aligned with the area Goals, Student Learning Objectives (SLOs), Content, Support, and Assessment? If they are not, what actions are planned? Yes

(5) If this course is in a GE Area with a stated enrollment limit, please indicate how or how practice and revisions in writing will be addressed with larger sections, particularly how students are receiving thorough feedback on the writing which accounts for the minimum word count in this GE category.

All sections except one were within enrollment limits of 40 students. The remaining section had 45. However, in practice that section was composed of two smaller sections. The section was team-taught, and each instructor ran his section as an independent section (We set the section up as team-taught rather than setting up two separate sections because of faculty appointment issues.).

Graders with backgrounds in the humanities were hired by the dean’s office to do all grading. All assignments were graded using detailed rubrics that were common to all sections with certain rubric elements linked to outcomes in Canvas. Additional student feedback was provided via comments posted in Speedgrader. Students were allowed to revise and resubmit assignments to improve their grades once per assignment except for the last assignment. Assignments with major grammar problems were not graded – they were returned to students to revise and resubmit (except for the last assignment). We believed that by the last assignment, students should be paying close attention to their grammar. This appeared to be the case since grades on the last assignment were actually higher than on the previous assignments.
General Education Annual Course Assessment Form

Course Number/Title __ME 195a___ GE Area: approved for S when combined with Engr 195a

Results reported for AY __16-17________ # of sections ____5_____ # of instructors ___6______

Course Coordinator: __Nicole Okamoto_____ E-mail: __nicole.okamoto@sjsu.edu____
Department Chair: ___Nicole Okamoto____ College: _____Engineering________

Part 1

(1) What SLO(s) were assessed for the course during the AY? All SLO’s for S were assessed (Area S SLO’s 1-4). Additional assessment was performed in Engr 195a.

(2) What were the results of the assessment of this course? What were the lessons learned from the assessment?

SLO’s were assessed based on three individual writing assignments. Results are shown in Table 1. This is an increase from one assignment in year 15-16. Writing assignments were assessed using common grading rubrics for all five sections and common graders. Results from all 158 students spread across the five sections are included. Lessons learned are included under section (3).

Table 1 Student Achievement of Area S SLO’s in ME 195a

<table>
<thead>
<tr>
<th></th>
<th>SLO 1</th>
<th>SLO 2</th>
<th>SLO 3</th>
<th>SLO 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Expectations</td>
<td>63.5</td>
<td>66.7</td>
<td>80.6</td>
<td>57.1</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>4.3</td>
<td>23.2</td>
<td>6.0</td>
<td>6.6</td>
</tr>
<tr>
<td>Does Not Meet Expectations</td>
<td>32.4</td>
<td>10.1</td>
<td>13.5</td>
<td>36.2</td>
</tr>
</tbody>
</table>

All assignments showed the link between the SJSU Studies SLO’s and engineering. Some students spend little time thinking about social and cultural effects of engineering, and the assignments and related class presentations and discussions have helped to broaden students’ perspectives.

(3) What modifications to the course, or its assessment activities or schedule, are planned for the upcoming year? (If no modifications are planned, the course coordinator should indicate this.)

Despite the detailed grading rubrics, many students didn’t really understand the level of analysis required for the papers, and their analysis was not of sufficient depth. Some good example papers have been posted on the ME 195a Canvas site for the 17-18 year to help with this understanding. Additionally, the weighting of the papers towards the total ME 195a grade has
been increased from 10% to 15% to motivate students to do a more thorough job with their papers.

**Part 2**

(4) Are all sections of the course still aligned with the area Goals, Student Learning Objectives (SLOs), Content, Support, and Assessment? If they are not, what actions are planned? Yes

(5) If this course is in a GE Area with a stated enrollment limit, please indicate how or how practice and revisions in writing will be addressed with larger sections, particularly how students are receiving thorough feedback on the writing which accounts for the minimum word count in this GE category.

All sections except one were within enrollment limits of 40 students. The remaining section had 49. However, in practice that section was composed of two smaller sections of about 25 each. The section was team-taught, and each instructor ran his section as an independent section (We set the section up as team-taught rather than setting up two separate sections because of faculty appointment issues.).

Graders with backgrounds in the humanities were hired by the dean’s office to do all grading except for grading of the content of the first individual writing assignment in ME 195a. In that assignment, students discussed issues related to area S SLO 2 in their senior design projects, so ME 195a instructor input was needed for grading. Even for that assignment, the humanities graders graded grammar, sentence structure, and organization.

All assignments were graded using detailed rubrics that were common to all sections with certain rubric elements linked to outcomes in Canvas. Additional student feedback was provided via comments posted in Speedgrader. Students were allowed to revise and resubmit assignments to improve their grades once per assignment. Assignments with major grammar problems were not graded – they were returned to students to revise and resubmit.
General Education Annual Course Assessment Form

Course Number/Title __ME 195b___ GE Area: approved for V when combined with Engr 195b
Results reported for AY __16-17________ # of sections ____5____ # of instructors ____6____

Course Coordinator: __Nicole Okamoto_____ E-mail: __nicole.okamoto@sjsu.edu____
Department Chair: ___Nicole Okamoto___ College: _____Engineering________

Part 1

(1) What SLO(s) were assessed for the course during the AY? All three SLO’s were assessed. Additional assessment was performed in Engr 195b.

(2) What were the results of the assessment of this course? What were the lessons learned from the assessment?

SLO’s were assessed based on three individual writing assignments, and results are presented in Table 1. This is an increase from one assignment in year 15-16. Writing assignments were assessed using common grading rubrics for all five sections and common graders. Results from all 158 students spread across the five sections are included. Lessons learned are discussed under (3).

Table 1 Student Achievement of Area V SLO’s in ME 195b

<table>
<thead>
<tr>
<th></th>
<th>SLO 1</th>
<th>SLO 2</th>
<th>SLO 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meets Expectations</td>
<td>81.6</td>
<td>50.3</td>
<td>87.7</td>
</tr>
<tr>
<td>Exceeds Expectations</td>
<td>3.4</td>
<td>3.1</td>
<td>6.3</td>
</tr>
<tr>
<td>Does Not Meet Expectations</td>
<td>15.2</td>
<td>46.6</td>
<td>6.3</td>
</tr>
</tbody>
</table>

All assignments show students the link between the SJSU Studies SLO’s and engineering. Engineering students understand that they work in a global community but don’t always have the background to understand the implications for their work. These assignments helped students to expand that understanding.

(3) What modifications to the course, or its assessment activities or schedule, are planned for the upcoming year? (If no modifications are planned, the course coordinator should indicate this.)

Students clearly did the worst on Area V SLO 2. This was the last individual writing assignment of the spring semester, when they were starting to get very busy with building and troubleshooting their senior design projects, and many students skipped the assignment (13.3%) or did the assignment quickly, with poor results. That assignment was also worth the least amount of
the three assignments for the semester in their final grades. To improve the rate of submission and increase the attention from the students, the amount that each assignment will be worth will be increased to 5% of the course grade per assignment. In previous years the first assignment was worth 5%, the second 3%, and the third 2%.

Part 2

(4) Are all sections of the course still aligned with the area Goals, Student Learning Objectives (SLOs), Content, Support, and Assessment? If they are not, what actions are planned? Yes

(5) If this course is in a GE Area with a stated enrollment limit, please indicate how or how practice and revisions in writing will be addressed with larger sections, particularly how students are receiving thorough feedback on the writing which accounts for the minimum word count in this GE category.

All sections except one were within enrollment limits of 40 students. The remaining section had 49. However, in practice that section was composed of two smaller sections of about 25 each. The section was team-taught, and each instructor ran his section as an independent section (We set the section up as team-taught rather than setting up two separate sections because of faculty appointment issues.).

Graders with backgrounds in the humanities were hired by the dean’s office to do all grading. All assignments were graded using detailed rubrics that were common to all sections with certain rubric elements linked to outcomes in Canvas. Additional student feedback was provided via comments posted in Speedgrader. Students were allowed to revise and resubmit assignments to improve their grades once per assignment. Assignments with major grammar problems were not graded – they were returned to students to revise and resubmit.
General Education Annual Course Assessment Form

Course Number/Title __ME 195a/b___   GE Area: approved for S and V when combined with Engr 195a/b

Results reported for AY __15-16________  # of sections ____5____# of instructors ____5____

Course Coordinator: __Nicole Okamoto_____ E-mail: __nicole.okamoto@sjsu.edu____
Department Chair: ___Nicole Okamoto____ College: _____Engineering________

Part 1

(1) What SLO(s) were assessed for the course during the AY?  Area S SLO 2, Area V SLO 1 (all SLO’s were evaluated in Engr 195a/b)

(2) What were the results of the assessment of this course? What were the lessons learned from the assessment?

Mechanical Engineering was approved by BOGS for a different set of writing assignments in their senior project courses than other engineering departments. Learning activities in ME 195a and b have been used to show students how the issues raised through the S and V learning objectives introduced in Engr 195a/b relate to the everyday work they will be doing as engineers. To help students see this connection, the assignments all directly relate to students’ senior design projects. Each semester included one individual writing assignment and one as a team. The minimum number of words written for these assignments combined was 1500 individual plus 1500 as a team (in addition to words written in Engr 195a/b).

ME 195a/b class time devoted to GE topics over the two semesters was equivalent to eight 50-minute class periods. Student teams had one meeting with instructors each semester to discuss their writing assignments. Students also attended three seminars entitled, Impact of Technology on Society, On Global Economy and Social Impacts, and Energy, Environment and Global Impacts. Students took a quiz on the content of the last two seminars.

Data for the four assignments are shown in Table 1. For some class sections, students were allowed to revise and resubmit their individual writing assignment for ME 195a based on instructor feedback, resulting in strong scores. Assignments were given in all sections, and the results presented are an average for the five sections. An assignment was rated as “meets expectations” if the grade was a C- or better. An assignment was rated as “exceeds expectations” if they received an A or A-. Only average scores are given for the two quizzes (based on two of the presentations), which were on a low level on Bloom’s taxonomy.

Data show good achievement of SLO 2 for S and acceptable achievement of SLO 1 for V. In general, students do a thorough job thinking through safety and environmental implications of their projects as well as social and cultural implications of their projects here within the United States. However, they have a harder time discussing global implications, which are covered in the ME 195b assignments. While the data for SLO 1 for V look promising, for many students their achievement was barely acceptable, with discussions that did not show as thorough an understanding of different cultures outside the US as we might hope. The higher scores for the individual writing assignment in ME 195a may also be because that assignment is introduced with a one-hour presentation with detailed examples of the kinds of discussions to include.
In this second year of GE certification, instructors were more comfortable with the GE elements of their classes, providing more thorough grading – and readily turning in assessment results of their courses. As a result, we saw a greater range of grades for assignments than in the previous year. One instructor in 14-15 did not provide any feedback to students on assignments, and that instructor was removed from teaching ME 195a/b in 15-16.

(3) What modifications to the course, or its assessment activities or schedule, are planned for the upcoming year? (If no modifications are planned, the course coordinator should indicate this.)

1. On the final report grading rubric for ME 195a and b, the points that students can achieve for sections
Part 2

(4) Are all sections of the course still aligned with the area Goals, Student Learning Objectives (SLOs), Content, Support, and Assessment? If they are not, what actions are planned? Yes

(5) If this course is in a GE Area with a stated enrollment limit, please indicate how or how practice and revisions in writing will be addressed with larger sections, particularly how students are receiving thorough feedback on the writing which accounts for the minimum word count in this GE category.

All sections except one were within enrollment limits of 40 students. The remaining section had 42, which was within 5% of the enrollment limit. These small section sizes give instructors the
time to provide feedback to students. In addition to providing feedback on writing assignments (using detailed rubrics as well as written comments), all instructors schedule regular meetings with student teams of 3-6 students. Graders with a background in the humanities are being hired for the 16-17 year to provide additional feedback to students on essay grammar and structure.
General Education Annual Course Assessment Form

Course Number/Title __ME 195a/b__  GE Area: approved for S and V **when combined with Engr 195a/b**

Results reported for AY __14-15________  # of sections ____4_____  # of instructors ____6_____

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Department Chair: ___Tai-Ran Hsu____  College: _____Engineering________

**Instructions:** Each year, the department will prepare a brief (two page maximum) report that documents the assessment of the course during the year. This report will be **electronically submitted to <curriculum@sjsu.edu>,** by the department chair, to the Office of Undergraduate Studies, with an electronic copy to the home college by October 1 of the following academic year.

**Part 1**

(1) What SLO(s) were assessed for the course during the AY?  Area S SLO 2, Area V SLO 1 (all SLO’s were evaluated in Engr 195a/b)

(2) What were the results of the assessment of this course? What were the lessons learned from the assessment?

Mechanical Engineering was approved by BOGS for a different set of writing assignments in their senior project courses than all other engineering departments. Learning activities and assignments in ME 195a and b have been used to show students how the important issues raised through the S and V learning objectives introduced in Engr 195a/b relate to the everyday work they will be doing as engineers. To help students see this connection, the assignments all directly related to students’ senior design projects. Each semester included one individual writing assignment and as a one team. The minimum number of words written for these assignments combined was 1500 individual plus 1500 as a team (These are in addition to words written in Engr 195a/b). Students also attended three related seminars to help provide the context for these assignments: Impact of Technology on Society, On Global Economy and Social Impacts, and Energy, Environment and Global Impacts.

Data for the four assignments are shown in Table 1. The percent of students who had an acceptable discussion of the relevant learning outcome is given for each assignment, and the average score for some are also provided. For some class sections, students were allowed to revise and resubmit their individual writing assignment for ME 195a based on instructor feedback, resulting in strong scores.
Table 1: Summary of Results of GE Writing Assignments in ME 195a and b

<table>
<thead>
<tr>
<th>Section number</th>
<th>Individual Writing Assignment, ME 195a (SLO 2, area S)</th>
<th>Final Report Section, ME 195a (SLO 2, area S)</th>
<th>Individual Writing Assignment, ME 195b (SLO 1, area V)</th>
<th>Final Report Section, ME 195b, (SLO 1, area V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Average: 88% % acceptable: 100%</td>
<td>Percent Acceptable: 100%</td>
<td>Percent Acceptable: 100%</td>
<td>Percent acceptable: 100%</td>
</tr>
<tr>
<td>2</td>
<td>Average: 91% % acceptable: 100%</td>
<td>Percent Acceptable: 100%</td>
<td>Average: 79% % acceptable: 88%</td>
<td>Percent Acceptable: 88%</td>
</tr>
<tr>
<td>3</td>
<td>Average*: 83% % acceptable*: 100%</td>
<td>Percent Acceptable*: 100%</td>
<td>Average*: 74% % acceptable*: 50%</td>
<td>Percent Acceptable: 87%</td>
</tr>
<tr>
<td>4</td>
<td>Average: 81% % acceptable: 96%</td>
<td>Percent acceptable: 100%</td>
<td>Average: 87% % acceptable: 91%</td>
<td>Percent Acceptable: 87%</td>
</tr>
</tbody>
</table>

*Data based on scores of 6 students out of 43. Data for remaining 37 students unavailable.

Data show good achievement of SLO 2 for S and SLO 1 for V in ME 195a/b. In general, students do a thorough job thinking through safety and environmental implications of their projects as well as social and cultural implications of their projects here within the United States. However, they have a harder time discussing global implications. While the data for SLO 1 for V show that a strong majority of students had acceptable discussions of these elements, for many students that achievement was barely acceptable, with discussions that did not show as thorough an understanding of different cultures outside the US as we might hope.

(3) What modifications to the course, or its assessment activities or schedule, are planned for the upcoming year? (If no modifications are planned, the course coordinator should indicate this.)

1. The prompts for the writing assignment relating to global effects of their senior design projects will be made more general. The current prompts make it difficult for students working on certain projects to present a thorough discussion. A minimum number of references will also be required to give students the background to provide a more thorough discussion.
2. If students write papers that present only a surface-level understanding of global effects (ME 195b individual writing assignment), their instructors will provide feedback to help them think through these issues and then allow them to revise and resubmit their individual assignments.
3. Some of the data from Section 3 was missing. We will ensure that we have data for 100% of students in the future.
Part 2

(4) Are all sections of the course still aligned with the area Goals, Student Learning Objectives (SLOs), Content, Support, and Assessment? If they are not, what actions are planned?

Yes

(5) If this course is in a GE Area with a stated enrollment limit (Areas A1, A2, A3, C2, D1, R, S, V, & Z), please indicate how oral presentations will be evaluated with larger sections (Area A1), or how practice and revisions in writing will be addressed with larger sections, particularly how students are receiving thorough feedback on the writing which accounts for the minimum word count in this GE category (Areas A2, A3, C2, D1, R, S, V, & Z) and, for the writing intensive courses (A2, A3, and Z), documentation that the students are meeting the GE SLOs for writing.

All sections except one were within enrollment limits of 40 students. The remaining section had 43, but it had two instructors and was within 10% of the enrollment limit. All sections in the current academic year (2015-16) are within the enrollment limit. These small section sizes give instructors the time to provide feedback to students. In addition to providing feedback on writing assignments (using detailed rubrics as well as written comments), all instructors schedule regular meetings with student teams of 3-6 students.