Part A

1. **List of Program Learning Outcomes (PLOs)**
   
   Please list PLOs. The PLOs should be appropriate to the degree and consider national disciplinary standards. Each outcome should describe how students can demonstrate learning.

   The Master of Science in General Engineering program uses the Program Learning Outcomes (PLO) shown below. The General Engineering department is committed to fulfill the following learning objectives in its Master of Science in Engineering program:

   PLO 1 - Work collaboratively with various disciplines of engineering, science and business
   PLO 2 - Apply advanced theory and analysis for problem solving and synthesize and integrate information in the engineering process.
   PLO 3 - Effectively communicate for problem analysis and solution.
   PLO 4 - Deliver effective presentations of engineering activities in written and oral formats. PLO 5 - Be aware of ethical, economic and environmental implications

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

   (Please indicate how your PLOs map to the University Learning Goals below by listing the PLO under each relevant ULG, or including this map in table form (see examples here). Use the link above for a full description of each ULG.)

   The five University Learning Goals are listed below:
1. ULG #1 - Specialized Knowledge: Depth of knowledge required for a degree, as identified by its program learning outcomes

2. ULG #2 - Broad Integrative Knowledge: Mastery of each step of an investigative, creative, or practical project. Understanding of the implications of results or findings from a particular work in societal context

3. ULG #3 - Intellectual Skills: Fluency in the use of specific theories, tools, technology, and graphical representation. Skills and abilities necessary for life-long learning: critical and creative thinking effective communication, conscientious information gathering and processing, mastery of quantitative methodologies, and the ability to engage effectively in collaborative activities

4. ULG #4 - Applied Knowledge: Ability to integrate theory, practice, and problem-solving to address practical issues. Ability to apply their knowledge and skills to new settings or in addressing complex problems. The ability to work productively as individuals and in groups

5. ULG #5 - Social and Global Responsibilities: Ability to act intentionally and ethically to address a global or local problem in an informed manner with a multicultural and historical perspective and a clear understanding of societal and civic responsibilities. Diverse and global perspectives through engagement with the multidimensional SJSU community

The mapping of MS General Engineering PLOs to the University Learning Goals is shown in the table below.

<table>
<thead>
<tr>
<th>MS General Engineering Program Learning Objectives (PLOs)</th>
<th>ULGs</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLO1: Work collaboratively with various disciplines of engineering, science and business.</td>
<td>X</td>
</tr>
<tr>
<td>PLO2: Apply advanced theory and analysis for problem solving and synthesize and integrate information in the engineering process.</td>
<td>X</td>
</tr>
<tr>
<td>PLO3: Effectively communicate for problem analysis and solution.</td>
<td>X</td>
</tr>
<tr>
<td>PLO4: Deliver effective presentations of engineering activities in written and oral formats.</td>
<td>X</td>
</tr>
<tr>
<td>PLO5: Be aware of ethical, economic and environmental implications.</td>
<td>X</td>
</tr>
</tbody>
</table>

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

The courses in the program are shown below in the order in which they are taken, followed by a table showing which PLOs are addressed by each course.

The levels of attainment of courses to the MS General Engineering Program Learning/Student Outcomes are shown in the Table 3 below. In the table, the numbers (1 to 5) represent the levels of support such that blank (or 0) means "no support," 1 is minimum support and 5 is the highest support. We begin with including a summary of the common MS Engineering common core courses (Engr201,
ENGR202, and ENGR203), technical writing course (ENGR200W), and culminating project and thesis courses (ENGR281, ENGR 298, and ENGR299).

**ENGR 201:** Engineering Analysis - Mathematical techniques for solving engineering problems. Topics include linear systems analysis, probability and statistics, and differential equations. Applications include modeling and simulation, optimization, projection, experimental design. Several computer projects are required.

**ENGR 202:** Systems Engineering - Large scale system design and development. Integrated approach including mission statement, synthesis of design concepts, tradeoff studies, risk assessment and interactions encountered in the optimal design, development, manufacture and test of systems.

**ENGR 203:** Engineering Management - Students will develop contemporary expertise in the principles of engineering finance, management, IP, operations management, performance metrics, and their application to design, development, and commercialization of new products and services in dynamic environments.

**ENGR 200W:** Engineering Reports and Graduate Research - Graduate level technical writing workshop designed to develop advanced communication skills that will readily transfer to the engineer’s professional needs, along with research methodologies, copyright issues, and proper documentation for the master’s thesis project.

**ENGR 281:** Master’s Project/Thesis Preparation Seminar - Preparation for project or thesis research, including development of scope, assembly of committee, preparation of schedule, completion of literature survey, completion of introductory chapter for final report, and research proposal examination at the end of the course.

**ENGR 298:** Master’s Project II - Completion of an in-depth project, a detailed project report, followed by a comprehensive presentation and demonstration of project.

### Program Outcomes versus Courses

<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>ENGR201</th>
<th>ENGR202</th>
<th>ENGR203</th>
<th>ENGR 200W</th>
<th>ENGR 281</th>
<th>ENGR 298</th>
<th>ENGR 299</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>PLO2</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>PLO3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>PLO4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>PLO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
Table 3: The levels of attainment of courses to the MS General Engineering Program Learning/Student Outcomes.

4. Planning – Assessment Schedule
The overall data collection (C), evaluation (E), and implementation (I) schedule for the General Engineering graduate program is shown in Table 4 below. The figure only shows the schedule for the assessment of the Program Educational Objectives. Data collection, evaluation, and implementation of any changes, if any, are conducted each.

<table>
<thead>
<tr>
<th>PLO</th>
<th>F-14</th>
<th>S-15</th>
<th>F-15</th>
<th>S-16</th>
<th>F-16</th>
<th>S-17</th>
<th>F-17</th>
<th>S-18</th>
<th>F-18</th>
</tr>
</thead>
</table>

Table 4: The Overall Program Assessment Schedule
5. **Student Experience**
   a. Course learning outcomes are provided on each syllabus. However, program learning outcomes are provided in some syllabi but not all. They should be added for the AY2016-17.

   b. As mentioned above, the program learning outcomes were developed by a General Engineering faculty committee. The team consists of the General Engineering Director, the Associate Dean for Graduate and Extended Studies, and faculty. Students have not been involved in development of the PLO’s. However, students fill out a survey after each course that evaluates importance and achievement of course learning outcomes.

   - The current set of MS Engineering Program Educational Objectives is available in the university catalog and posted on the General Engineering Department website at http://generalengineering.sjsu.edu/assessmentms/student_experience
   - The Program Educational Objectives are determined and evaluated through consultation involving students, Industry and academic advisers, and faculty.
   - Students have limited knowledge of the program outcomes.

**Part B**

6. **Assessment Data and Results**

   The assessment data were collected in the form of course assessment journals prepared by the instructors at the end of each course. Learning outcomes were evaluated using both direct and indirect methods. Three courses have been assessed: Engr 202, 281, and 298.

   **Direct Measurement:** For each Course Learning Outcome, instructor set the performance criteria. This is the percentage at which a student demonstrates satisfactory proficiency. The performance criteria should not be less than 70%. Using the results of the direct assessment (performance) data that was collected (through HW, exam questions, etc.), the percentage of students who reached the performance criteria is shown in the Course Assessment Journal. Instructors analyze and discuss discrepancies in Section 3 (Findings and Analysis).

   **Indirect Measurement:**

   **CLO Results**
   In the survey, students were asked to give a letter (A to E) to measure how important each CLO was and whether they felt they had learned and achieved the CLO. Instructors convert the A to E measurement into numeric scores of 5 to 1 (respectively). If there is a difference of over 1 pt, between Part I and Part II, instructors address in Section 3 (Findings and Analysis)

**ENGR 202:** Systems Engineering - Large scale system design and development. Integrated approach including mission statement, synthesis of design concepts, tradeoff studies, risk assessment and interactions encountered in the optimal design, development, manufacture and test of systems.

   CLO1: Attain an understanding of the theory and application of systems engineering. CLO2: Understand the systems engineering project development cycle.
   CLO3: Able to understand system requirements, and translate those requirements into engineering specifications.
   CLO4: Know how and when to use simulation and modeling in the systems development cycle.
   CLO5: Develop application proficiency by completing a systems project in laboratory work.
   CLO6: Develop skills needed to be an effective systems team member.
   CLO7: Develop project planning, implementation, and reporting
The instructor performed both direct and indirect measurement but nothing to report. There were no significant changes.

ENGR 281: Master’s Project/Thesis Preparation Seminar - Preparation for project or thesis research, including development of scope, assembly of committee, preparation of schedule, completion of literature survey, completion of introductory chapter for final report, and research proposal examination at the end of the course.

CLO1: Organize teams as necessary to complete a project/thesis.
CLO2: Utilize information from a range of sources to develop the scope for the project/thesis.
CLO3: Effectively communicate technical components for project/thesis to a professional audience.
CLO4: Develop industrially sponsored project/thesis which incorporates contemporary resources and personnel to address significant problems.
CLO5: Effectively communicate technical components for project/thesis to a professional audience.
CLO6: Effectively communicate all non-technical aspects for project/thesis to a professional audience.
CLO7: Analyze the economic justification for the project/thesis activity.

Mapping between ENGR 281 Course Learning Objectives (CLOs) and PLOs:
For direct measurement: Students did a good job in performed CLOs except for CLO1. No significant findings for this CLO 1, only stressful time for the students in forming the committee.

For indirect measurement: Informal discussion was held with students throughout the semester several times. General Engineering students felt that they were second class students and that other department faulty did not really help them. Many of the students felt that they were under a lot of stress to get the committee formed per requirement of SJSU. It was not easy by any standards. Going forward, the faculty of other departments must be requested by the dean or other authoritative staff to help General Engineering students. If not this course with ENGR 298 should be replaced by a different course to reduce the stress on the students.

**ENGR 298:** Master’s Project II - Completion of an in-depth project, a detailed project report, followed by a comprehensive presentation and demonstration of project.

- **CLO1:** Continuing to enhance and improve their ability to collaborate with their colleagues in various disciplines in engineering, science, and business.
- **CLO2:** Continuing to enhance the ability to apply ENGR 200W (Technical Writing), ENGR 201 (Engineering Analysis), and ENGR 203 (Engineering Management) concepts and related advanced theory and analysis for problem solving.
- **CLO3:** The synthesis and integration of information in the engineering process
- **CLO4:** Effective communication of problem analysis and solutions
- **CLO5:** Applying contemporary tools for computation, simulation, analysis, and design
- **CLO6:** Deliver effective presentations of engineering activities in written and oral formats
- **CLO7:** Enhancing awareness of the ethical, economic, and environmental implication of their engineering activities

Mapping between ENGR 298 Course Learning Objectives (CLOs) and PLOs:

<table>
<thead>
<tr>
<th>Course Learning Objective (CLO)</th>
<th>PLO1</th>
<th>PLO2</th>
<th>PLO3</th>
<th>PLO4</th>
<th>PLO5</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLO1</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CLO2</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CLO3</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLO4</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>CLO5</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLO6</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CLO7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

No measurement has been performed for this course. There are only two students enrolled in the course.

7. **Analysis**
All CLOs achieved the minimum threshold of students meeting or exceeding the criterion for each course. Except, for Engr 298 in which there were no data collected. There will be proposed changes to achieve better results for next assessment cycle AY2016-17.

8. **Proposed changes and goals (if any)**
What actions were planned and/or implemented to address the findings from collected data? Actions taken can include revising course content, test revision, projects. These proposed changes to courses should be implemented for AY2016-17.

1) Engr 202, CLO2
   a. Extra HW problems assigned for this area and post solutions on Canvas.

2) Engr 281 CLO1
   a. The General Engineering Department should plan on the following: (1) Allow registration in this course only after forming a committee. (2) make sure those full time faculties are available for General Engineering students to pursue interesting projects to their liking.

3) Engr 298
   a. There were no data collected in this course.

Part C
The changes proposed above will not be implemented until the next offering in the next cohort, which will not be for several years.

<table>
<thead>
<tr>
<th>Proposed Changes and Goals</th>
<th>Status Update</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr 202 – Extra HW problems assigned for this area and post solutions on Canvas.</td>
<td></td>
</tr>
<tr>
<td>Engr 281 – (1) Allow registration in this course only after forming a committee. (2) Make sure those full time faculties are available for General Engineering students to pursue interesting projects to their liking.</td>
<td></td>
</tr>
</tbody>
</table>