PROGRAM ASSESSMENT

ASSESSMENT ACTIVITIES

<table>
<thead>
<tr>
<th>Degree Program:</th>
<th>Chemical and Materials Engineering</th>
<th>Location:</th>
<th>On Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Coordinator:</td>
<td>S. Gleixner and M. McNeil</td>
<td>Term:</td>
<td>AY 2010-2011</td>
</tr>
</tbody>
</table>

This a joint assessment report for the M.S. in Materials Engineering and M.S in Chemical Engineering at San José State University for AY- 2010-2011. The programs have the same program outcomes and are assessed in classes that have both student groups in them.

PROGRAM OUTCOMES

1. Are able to solve complex engineering problems and tasks, and use engineering, science and statistics principles to justify recommendations
2. Are able to evaluate the impact of their work on society, including ethical, economic, global and environmental aspects.
3. Can deliver effective presentations of engineering results in written and oral formats.
4. Have life-long learning skills and are able to apply their engineering knowledge to critically evaluate relevant literature and new technologies or systems.
5. Are effective leaders, capable of working in diverse environments.
6. Are able to apply their engineering education to a variety of career paths.

ASSESSMENT ACTIVITIES

The program outcomes are assessed at the end of MatE/ChE 281 each semester. In this course, students develop their detailed experimental plan for their project or thesis. The course culminates with the students submitting a detailed written proposal and have an oral presentation of their proposal. Following the oral presentation, the reading committee evaluates the student using the attached MatE/ChE 281 rubric. The reading committee is made up of a minimum of three people, two of which are SJSU faculty members. The third is typically an industry representative.

The program outcomes are assessed again at the end of the student’s project or thesis experience (MatE/ChE 298 or 299). This is done at their oral defense (which is scheduled individually for each student). The reading committee evaluates the student again using the same questions and rubric. The 298/299 rubric is attached.

Results of the assessment are discussed every summer at our faculty retreat.
SUMMARY OF DATA FROM AY 2010-2011

The table below details the average results of the assessment done by the reading committees following 281 for both Fall 2010 and Spring 2011 (15 total students) and 298/299 for Summer 2010, Fall 2010, and Spring 2011 (19 total students). Note that the question wording for each number and the meaning of the numerical ratings are given in the attached rubrics.

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<tr>
<td>281 Avg</td>
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<td>298/299 Avg</td>
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<td>298/299 StDev</td>
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Program Outcome #1

Are able to solve complex engineering problems and tasks, and use engineering, science and statistics principles to justify recommendations

1.1 What have you learned about this Student Learning Outcome?

[SEMESTER/YEAR] – Briefly summarize the discussion surrounding this outcome, i.e., what does the faculty conclude about student learning for this SLO?

This was assessed in question 4 of the 281 and 298/299 rubrics. Students adequately achieved this outcome after the 281 class and somewhat improved over the course of their research project as assessed at the 298/299 defense. This reflects both the strong foundation in chemical and materials engineering the students received in the core classes and the design of experiments workshops in 281. In general, the research projects and thesis do show that students are able to synthesize and apply the theoretical concepts that they learned in the core classes.

1.1 Action Items(s) (if necessary):

[SEMESTER/YEAR] – What actions will the department take to improve student learning, e.g., program changes, changes in pedagogy, process changes, resources requests, etc?

Students struggle with design of experiments and statistically evaluating data. The graduate coordinators will work with faculty to get this material implemented into core classes so that students are exposed to it before they are designing their proposals.

Program Outcome #2

Are able to evaluate the impact of their work on society, including ethical, economic, global and environmental aspects.

2.1 What have you learned about this Student Learning Outcome?
[SEMESTER/YEAR] – Briefly summarize the discussion surrounding this outcome, i.e., what does the faculty conclude about student learning for this SLO?

This was assessed in question 5 of the 281 and 298/299 rubrics. Students adequately achieved this outcome after the 281 class and further improved over the course of their research project as assessed at the 298/299 defense. This is heavily emphasized in the 281 class and seems to be adequately preparing students to articulate the broader considerations of their work.

2.2 Action Items(s) (if necessary):

[SEMESTER/YEAR] – What actions will the department take to improve student learning, e.g., program changes, changes in pedagogy, process changes, resources requests, etc?

Students excel at communicating the overall industries connection to society in terms of ethics, economic, and environmental impact. However, the sometimes struggle with articulating exactly what is the exact ethical, economic, or environmental impact of their project. The course coordinator will communicate with technical advisors to make sure students are required to make this connection.

Program Outcome #3

Can deliver effective presentations of engineering results in written and oral formats.

3.1 What have you learned about this Student Learning Outcome?

[SEMESTER/YEAR] – Briefly summarize the discussion surrounding this outcome, i.e., what does the faculty conclude about student learning for this SLO?

This program outcome was assessed in both questions 1 and 2 of the 281 and 298/299 surveys which had the reading committees assess the written and oral reports (respectively). Students received adequate scores on both oral and written communication. Strong emphasis is placed on the quality and content of the oral and written proposals in the 281 class that seem to be effective in preparing the students. The oral communication improved significantly in the 298/299 assessment. This is indicative of the fact that students were more confident with the material after performing the research and with subsequent practice of giving similar talks.

3.2 Action Items(s) (if necessary):

[SEMESTER/YEAR] – What actions will the department take to improve student learning, e.g., program changes, changes in pedagogy, process changes, resources requests, etc?

The course coordinator for 281 will continue to encourage students to use the Writing Center to improve the quality of their writing. The graduate coordinators will emphasize more strongly to technical advisors to be strict about grammar (and strict about requiring revisions of proposals and final reports that are not grammatically correct).

Program Outcome #4

Have life-long learning skills and are able to apply their engineering knowledge to critically evaluate relevant literature and new technologies or systems.
4.1 What have you learned about this Student Learning Outcome?

[SEMESTER/YEAR] – Briefly summarize the discussion surrounding this outcome, i.e., what does the faculty conclude about student learning for this SLO?

This was assessed in question 3 of the 281 and 298/299 rubrics. Students adequately achieved this outcome after the 281 class and further improved over the course of their research project as assessed at the 298/299 defense. Students get very specific guidelines in performing a literature review in 281 (as well as in the pre-requisite Engr 200W and several of the core classes). These exercises are preparing students to adequately seek out needed data from the literature.

4.2 Action Items(s) (if necessary):

[SEMESTER/YEAR] – What actions will the department take to improve student learning, e.g., program changes, changes in pedagogy, process changes, resources requests, etc?

While students are doing an adequate job with literature reviews, they still struggle with critically evaluating the literature. The course coordinator will emphasize to students and advisors that the students need to be evaluating the papers they review for factors such as validity, relevance to different situations, etc. Students will also be encouraged to make stronger connections between the literature and the impact on their proposed work or research findings.

Program Outcome #5

Are effective leaders, capable of working in diverse environments.

5.1 What have you learned about this Student Learning Outcome?

[SEMESTER/YEAR] – Briefly summarize the discussion surrounding this outcome, i.e., what does the faculty conclude about student learning for this SLO?

This is not a program outcome. It is a program educational objective, reflecting how the impact of the degree on the student's future career. It can not be assessed during the degree program.

5.2 Action Items(s) (if necessary):

[SEMESTER/YEAR] – What actions will the department take to improve student learning, e.g., program changes, changes in pedagogy, process changes, resources requests, etc?

The department faculty are going to re-write our program outcomes and draft program educational objectives as part of our next faculty retreat.

Program Outcome #6

Are able to apply their engineering education to a variety of career paths.
6.1 What have you learned about this Student Learning Outcome?

[SEMESTER/YEAR] – Briefly summarize the discussion surrounding this outcome, i.e., what does the faculty conclude about student learning for this SLO?

This is not a program outcome. It is a program educational objective, reflecting how the impact of the degree on the student’s future career. It can not be assessed during the degree program.

6.2 Action Items(s) (if necessary):

[SEMESTER/YEAR] – What actions will the department take to improve student learning, e.g., program changes, changes in pedagogy, process changes, resources requests, etc?

The department faculty are going to re-write our program outcomes and draft program educational objectives as part of our next faculty retreat.
## ChE/MatE 281 – Approval Form

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

**SJSU Thesis/Project Advisor**

**Must be person 1 or 2 on Committee**

<table>
<thead>
<tr>
<th>Reading Committee Members 1, 2 and 3 are required.</th>
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</thead>
<tbody>
<tr>
<td>1. CME tenured or tenure-track faculty member:</td>
<td></td>
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<tr>
<td>2. SJSU faculty member:</td>
<td></td>
</tr>
<tr>
<td>3. SJSU faculty member or industrial representative (senior):</td>
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<tr>
<td>Others (not required)</td>
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</table>

**Introduction**

<table>
<thead>
<tr>
<th>SJSU Advisor Approval</th>
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</table>

**Literature Search**

<table>
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<th>SJSU Advisor Approval</th>
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</table>

**Proposal**

<table>
<thead>
<tr>
<th>SJSU Advisor Approval</th>
<th></th>
</tr>
</thead>
</table>

### Proposal Examination Decision

**Choose one of the following**

**Pass/ Pass with Conditions.**

List the conditions in the box on the right.

**Fail**

List any comments in the box on the right.

USE AN EXTRA PAGE IF NECESSARY

**Approval of Proposal Decision**

<table>
<thead>
<tr>
<th>SJSU Research Advisor’s Signature/Date</th>
<th></th>
</tr>
</thead>
</table>

Committee Members Signatures

281 Instructor’s Signature/Date

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**Reading Committee:** As a team, please evaluate the oral and written presentations by scoring the statements on the back of this page using a ranking of 1 to 5 where 5 = excellent, 3=acceptable and 1=unacceptable. **NOTE:** SCORES OF ≤ 3 REQUIRE A CONDITION TO BE MET BY THE STUDENT BEFORE THEY CAN PASS THEIR DEFENSE.
1. The student delivered a professional written report. (Note: 1 = insufficient technical content and/or major formatting, and/or lack of adequate referencing, and/or major grammatical/spelling errors, 3 = acceptable technical content, formatting, referencing and grammar/spelling, 5 = excellent report in all aspects)

2. The student delivered a professional oral presentation. (Note: 1 = insufficient technical content and/or major errors in grammar/spelling and/or insufficient use of presentation software and/or in major errors in deliverance of a practiced presentation including response to questions, 3 = acceptable technical content, grammar/spelling, use of presentation software and deliverance of a practiced presentation including response to questions, 5 = excellent presentation in all aspects)

3. The student was able to show how his/her project relates to work reported in the literature. (Note: 1 = incomplete or irrelevant literature cited and/or inadequate literature discussion, 3 = adequate amount and discussion of relevant literature, 5 = excellent discussion of relevant literature)

4. The student was able to defend his/her proposed experiments based on established and accepted engineering, science and statistical principles. (1 = student did not or was not able to adequately justify the majority of their experimental proposal, 3 = student did adequately justify most aspects of their experimental proposal, 5 = excellent justification of all aspects of their experimental proposal)

5. The student was aware of the global impact of their work on society including the ethical and/or environmental and/or economic impact of his/her work. (Note: 1 = neither the oral nor written presentation had a separate section on the global impact of the proposed work, 3 = both the oral and written presentation had an adequate section on the global impact of the proposed work, 5 = both the oral and written presentation had an excellent section on the global impact of the proposed work).

Please write any other comments you think would help evaluate the quality of this proposal.
<table>
<thead>
<tr>
<th>CME 298/299 Oral Defense Evaluation Form – Semester:</th>
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</thead>
<tbody>
<tr>
<td>Student Name</td>
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</tr>
<tr>
<td>3. SJSU faculty member or industrial representative (senior):</td>
</tr>
</tbody>
</table>

**Thesis/Project Defense Decision**

Circle one of the following two results

**Pass**
List any conditions in the box on the right.
USE AN EXTRA PAGE IF NECESSARY

**Fail**
List any comments in the box on the right.

The Turnitin.com Report has been reviewed

SJSU Research Advisor Signature

**Approval of Thesis/Project Defense Decision**

SJSU Research Advisor’s Signature/

Committee Members
Signatures/Date

Reading Committee: As a team, please evaluate the oral and written presentations by scoring the statements on the back of this page using a ranking of 1 to 5 where 5 = excellent, 3=acceptable and 1=unacceptable. NOTE: SCORES OF < 3 REQUIRE A CONDITION TO BE MET BY THE STUDENT BEFORE THEY CAN PASS THEIR DEFENSE.
1. The student delivered a professional written report. (Note: 1 = insufficient technical content and/or major formatting, and/or lack of adequate referencing, and/or major grammatical/spelling errors, 3 = acceptable technical content, formatting, referencing and grammar/spelling, 5 = excellent report in all aspects) A level of 4 or above also implies that the report demonstrates a level of writing quality and technical analysis suitable for publication whether or not the focus is original enough to be published.

2. The student delivered a professional oral presentation. (Note: 1 = insufficient technical content and/or major errors in grammar/spelling and/or insufficient use of presentation software and/or in major errors in deliverance of a practiced presentation including response to questions, 3 = acceptable technical content, grammar/spelling, use of presentation software and deliverance of a practiced presentation including response to questions, 5 = excellent presentation in all aspects)

3. The student was able to show how his/her project relates to work reported in the literature. (Note: 1 = incomplete or irrelevant literature cited and/or inadequate literature discussion, 3 = adequate amount and discussion of relevant literature, 5 = excellent discussion of relevant literature)

4. The student was able to defend his/her proposed experiments based on established and accepted engineering, science and statistical principles. (1 = student did not or was not able to adequately justify the majority of their experimental results (no verification runs etc.), 3 = student did adequately justify most aspects of their experimental results, 5 = excellent justification of all aspects of their experimental results)

5. The student was aware of the global impact of their work on society including the ethical and/or environmental and/or economic impact of his/her work. (Note: 1 = neither the oral nor written presentation had a separate section on the global impact of the proposed work, 3 = both the oral and written presentation had an adequate section on the global impact of the proposed work, 5 = both the oral and written presentation had an excellent section on the global impact of the proposed work).

Using another page if necessary, please write any other comments you think would be helpful to access the quality of this project including whether the student showed significant improvement from the proposal defense to the final thesis/project defense.