2012-2013 Annual Program Assessment Report

Please submit report to your department chair or program coordinator, the Associate Dean of your College and the assessment office by Monday, September 30, 2013. You may submit a separate report for each program which conducted assessment activities.

College: College of Engineering and Computer Science

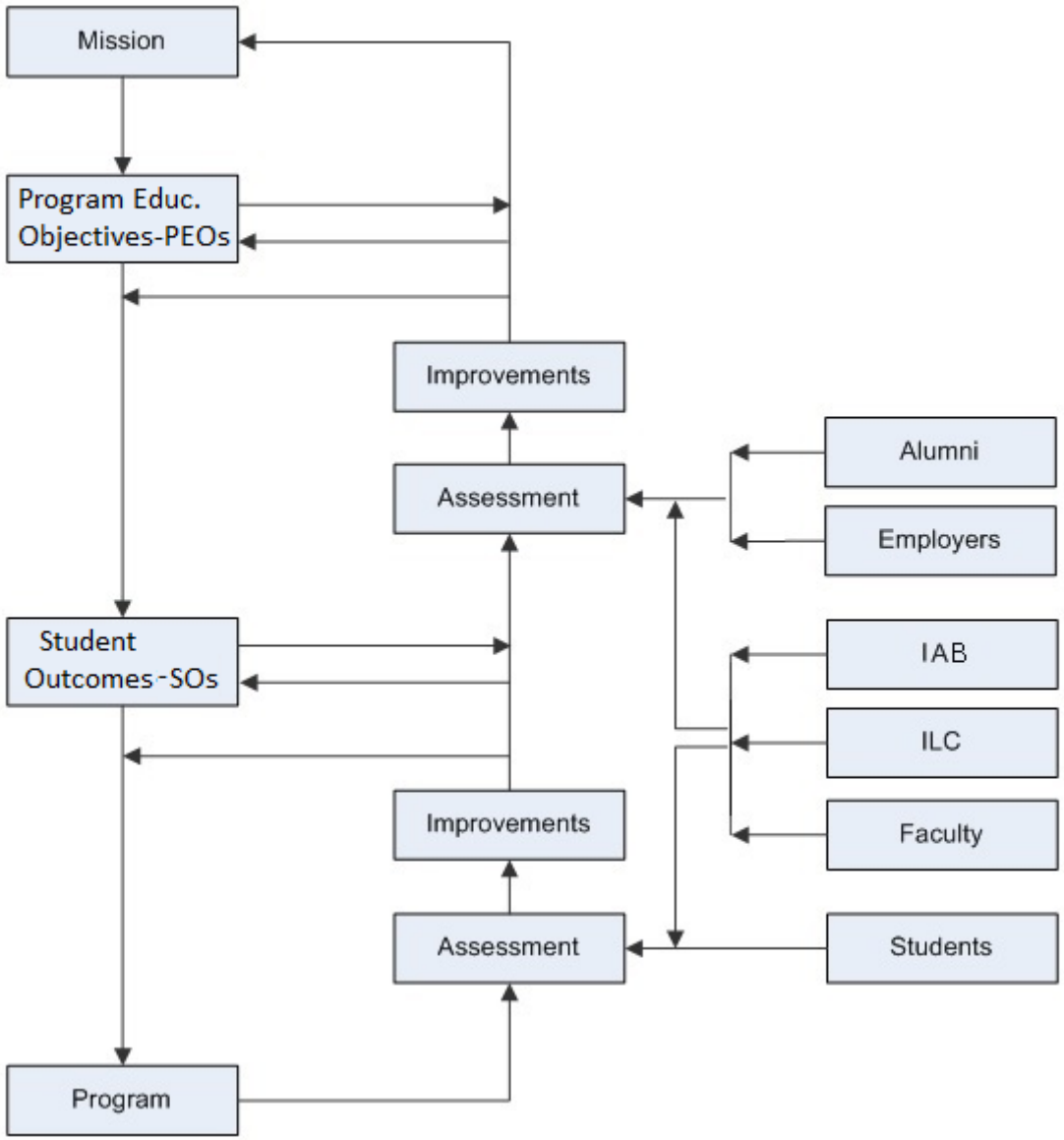
Department: Manufacturing Systems Engineering and Management

Program: MSE

Assessment liaison: Prof. Ahmad Sarfaraz

1. **Overview of Annual Assessment Project(s).** Provide a brief overview of this year's assessment plan and process.

   The academic year 2013 is the end of assessment cycle for assessing student outcomes for the BS programs. Based on the assessment plan and assessment cycle, assessment of all student outcomes and the department curriculum-faculty evaluation of student performance in MSE 402, MSE 415, and MSE 488A&B courses on homework assignments, class projects, reports, and examinations were performed. The demonstrated contribution ratings was used and summed for each outcome and compared to those in the Course Assessment Matrix, and the relative value of the differences (<, >, or =) were indicated the achievement of the outcomes. In addition to assessing the student outcomes, the alumni and employers, the MSEM department faculty and the MSEM ILC played also a primary role in evaluating the achievement of the Program Educational Objectives (PEO's). Furthermore, the assessment process was modified as shown in the following Figure.


Mission
Program Educ. Objectives-PEOs
Improvements
Assessment
Alumni
Employers
Student Outcomes-SOs
IAB
ILC
Faculty
Improvements
Assessment
Students
Program

2. **Assessment Buy-In.** Describe how your chair and faculty were involved in assessment related activities. Did department meetings include discussion of student learning assessment in a manner that included the department faculty as a whole?

   As shown in the assessment process, assessment information from faculty on the Student Learning Outcomes (SLOs) were acquired at department meetings and from the course/program analysis based on the data collected for the course folders and outcome folders. The information from the ILC members was collected from the ILC biannual meetings, or via email. The information from BS-MSE senior students were acquired from exit interviews and an exit survey, each of which is administered annually in the spring semester before graduation. The exit interviews were conducted by the Department Chair and focus on selected SLOs. The interview results were then translated into ratings, on a scale of 1 to 5 to represent the extent to which students perceive that the Outcome has been achieved. These ratings were compared with the achievement expectation ratings, which have been set at a value of 4. The exit survey was produced and processed by Educational Benchmarking, Inc. (EBI).

3. **Student Learning Outcome Assessment Project.** Answer items a-f for each SLO assessed this year. If you assessed an additional SLO, copy and paste items a-f below, BEFORE you answer them here, to provide additional reporting space.

   3a. Which Student Learning Outcome was measured this year?
   Since the academic year 2013 is the end of assessment cycle for the department, all sixteen student outcomes were assessed over a 6-year period. The sixteen student outcomes that were assessed are as follows:

   A. an ability to apply knowledge of mathematics, science, and engineering;
   B. an ability to design and conduct experiments, as well as to analyze and interpret data;
   C. an ability to design and manage effective systems, processes and environments for contemporary manufacturing enterprises;
   D. an ability to function productively on multicultural and multidisciplinary teams;
   E. an ability to identify, formulate and solve manufacturing systems engineering problems;
   F. an ability to understand, practice and nurture professional and ethical responsibilities;
   G. an ability to communicate effectively in both the written and spoken modes;

H. the intellectual and educational breadth necessary for understanding the impact of manufacturing systems engineering solutions in a global and societal context;

I. a recognition of the need for professional currency and an ability to engage in perpetual learning;

J. a knowledge of contemporary issues in society as well as those of the profession;

K. an ability to use the contemporary techniques, skills and tools necessary for effective manufacturing systems engineering practice;

3b. Does this learning outcome align with one or more of the university's Big 5 Competencies? (Delete any which do not apply)
Yes, it does.

- Critical Thinking
- Oral Communication
- Written Communication
- Quantitative Literacy
- Information Literacy

3c. Does this learning outcome align with University's commitment to supporting diversity through the cultivation and exchange of a wide variety of ideas and points of view? In what ways did the assessed SLO incorporate diverse perspectives related to race, ethnic/cultural identity/cultural orientations, religion, sexual orientation, gender/gender identity, disability, socio-economic status, veteran status, national origin, age, language, and employment rank?

The assessed SLO incorporated diverse perspectives related to the curriculum and the various guest lecturers from varying industry backgrounds that were brought into the various classes to bring in different perspectives as compared to the instructor. The effectiveness of these guest lecturers that visited the class were measured by putting in specific questions on the exam that related to the material covered by the guest lecturers. Furthermore, in some of the classes, the students were also shown videos about how concepts were carried out in the US and also in other countries, to understand the difference in implementation of various concepts from culture to culture.

3d. What direct and/or indirect instrument(s) were used to measure this SLO?

A combination of direct and indirect methods was used to assess the student outcomes. Direct instruments were used for department curriculum-faculty evaluation of student performance for the prefix core courses including homework assignments, class projects, reports, and examinations. For the first time in the department, performance indicators were used to assess some of the student outcomes (e.g., performance indicators were used for student outcomes E and G for some of the core courses in the BS-MSE). Indirect methods were also used to collect data from the alumni and employers, the MSEM department faculty to assess the student outcomes.

3e. Describe the assessment design methodology: For example, was this SLO assessed longitudinally (same students at different points) or was a cross-sectional comparison used (Comparing freshmen with seniors)? If so, describe the assessment points used.

Based on the assessment plan, department curriculum-faculty evaluation of student performance in MSE 402, MSE 415, and MSE 488A&B courses on homework assignments, class projects, reports, and examinations we performed. The demonstrated contribution ratings was used and summed for each outcome and compared to those in the Course Assessment Matrix, and the relative value of the differences (<, >, or =) were indicated the achievement of the outcomes. The academic year 2013 is the end of assessment cycle for assessing student outcomes for the BS-MSE. In addition to assessing the student outcomes, the alumni and employers, the MSEM department faculty and the MSEM ILC played also a primary role in evaluating the achievement of the student outcomes and the Program Educational Objectives (PEO's).

3f. Assessment Results & Analysis of this SLO: Provide a summary of how the results were analyzed and highlight findings from the collected evidence.

The evaluation process of the assessment results of the program SOs provides a basis for continuous improvement. Information regarding the continuous improvement for the Student Outcomes was analyzed and discussed primarily during periodic meetings, formal course assessments, surveys, exit interviews, extracurricular activities (Student Chapters, Project Showcase and national competitions such as SME/AeroDef and TechFest), together with ongoing informal student faculty interactions.

3g. Use of Assessment Results of this SLO: Describe how assessment results were used to improve student learning. Were assessment results from previous years or from this year used to make program changes in this reporting year? (Possible

changes include: changes to course content/topics covered, changes to course sequence, additions/deletions of courses in program, changes in pedagogy, changes to student advisement, changes to student support services, revisions to program SLOs, new or revised assessment instruments, other academic programmatic changes, and changes to the assessment plan.)

Closing assessment loops led actions to improve the quality of the BS-MSE program include those that were initiated and fully implemented during AY 2007-2013, those that have been initiated and are in the process of being implemented and those more recently proposed for consideration. Some of the selected continuous improvement actions that are led to enhance student learning outcomes are shown below (Please note the actions are divided into three categories: fully implemented, in-process, and proposed.)

Outcome A

- In MSE403CS, given the students' lack of understanding of operations management concepts and in order to fill this void, the instructor tried to teach some basic concepts such as decision analysis, optimization and quality wherever applicable in the core topics of the course.
- In MSE415, the instructor emphasized the development of the students' ability to design a product or system.
- In MSE304 (spring, 2012), breaking down the scores for each Student Outcome for comparison to those from the fall of 2011 allowed for a more thorough evaluation of each Student Outcome.

Outcome B

- In MSE403, students were taught to work with MS Excel in order to analyze data needed for facilities planning.

Outcome C

- In MSE415, the instructor emphasized the development of the students' ability to design a product or system.

Outcome D

- In MSE304, students were required to select and complete a project based on the instructor-identified project topic.
- Students enrolled in MSE402 were from a wide range of engineering discipline backgrounds, experience levels and cultural backgrounds, which helps to satisfy several Student Outcomes.
- From the last ABET visit, it was recommended that student understanding of the design process be improved. In two semesters, MSE415 was taught (fall, 2011 and 2012) and much more emphasis was placed on teaching the design process by using real cases. Engineering students worked in collaboration with business students on projects provided by the CSUN

Wells Fargo Center. Skills for working in multidisciplinary teams in order to design, manufacture and market a product were also emphasized. Creative teaching methods including showing videos related to each topic were employed in order to enhance student learning. Rubrics were developed and used to evaluate reports and oral presentations of student group projects.

Outcome E

- In MSE304 (spring, 2012), breaking down the scores for each Student Outcome for comparison to those from the fall of 2011 allowed for a more thorough evaluation of each Student Outcome.
- In MSE409, students designed and analyzed their final project parts. Their designs were required to have more than one cutting direction that necessitates resetting of the parts.

Outcome F

- Ethics was taught more in detail in MSE101/L and MSE488A&B. Ethics information was specified in most core course syllabi.
- In MSE304, Ethics codes were stated in the course syllabi.

Outcome G

- In most BS-MSE courses, new rubrics (for Written Communication, based on those designed by the College) were adopted and used in recent semesters in the analysis of the projects in order to give a valid judgment score for student reports.
- Students enrolled in MSE415 come from a wide range of engineering discipline backgrounds, experience levels and cultural backgrounds. This creates some challenges, especially for international students, since English is not their primary language (fall, 2011). In the fall of 2012, a great deal of effort was placed on helping students meet these challenges and improve their written and oral communication. For example, students were referred to the university Writing Center to have their reports checked for grammatical errors. Also, the instructor read the reports and reviewed their PowerPoint presentations on a regular basis and gave feedback to students in order to improve their communication skills. That also helped students function productively in their teams.
- In MSE304 (spring, 2012), breaking down the scores for each Student Outcome for comparison to those from the fall of 2011 allowed for a more thorough evaluation of each Student Outcome.

Outcome I

- Students enrolled in MSE402 were from a wide range of engineering discipline backgrounds, experience levels and cultural backgrounds, which helps to satisfy several Student Outcomes.

Outcome K

- In MSE304, in addition to solving methods for homework problems by hand, MS Excel applications were added in order to solve engineering problems, thus enhancing the use of skills and tools necessary for this course.
- In MSE403, students were taught to work with MS Excel in order to analyze data needed for facilities planning.
- In MSE409, students designed and analyzed their final project parts. Their designs were required to have more than one cutting direction that necessitates resetting of the parts.
- Improve the level of machining skills and ensure safety in the heavy-duty manufacturing labs (e.g. MSEM lab JD1128 and College Machining Shop JD1615). Starting in the fall of 2012, the College initiated an intensive machining free workshop (3days, 8 hours/day) in which students need to pass the training in order to be allowed access to the machining lab.

Outcome N

- In MSE304, the application of Form 1040 was discussed in class so that they would be able to use it in their projects (reflecting after-tax analysis from Ch17 in the textbook).

Outcome O

- In MSE403CS, given the students' lack of understanding of operations management concepts and in order to fill this void, the instructor tried to teach some basic concept such as decision analysis, optimization and quality, wherever applicable in the core topics of the course.

In-Process Continuous Improvement Actions

Outcome A

- Discussion of "SimProcess" example models is given in MSE410 before assigning related homework projects to students in order to help them learn and understand the operation of manufacturing systems in general. Students were asked to briefly present how they create models for solving problems for the projects. The instructor made sure that the students clearly understood SimProcess projects before they started.

Outcome B

- Participation at the Manufacturing Challenge Contest (SME/WESTEC and SME/AeroDef) contributes to the improvements of this Student Outcome. Students in the senior design courses (MSE488A&B) engage in the design of new products or systems and also analyze related data.

Outcome C

- Participation at the Manufacturing Challenge Contest (SME/WESTEC and AeroDef) contributes to the improvements of this Student Outcome. Part of the requirement of senior design classes (MSE488A&B) is for students to design and manage effective systems and process environments for contemporary manufacturing enterprises. Sample evidence of achievement of this Student Outcome is shown in the students' final project reports. The projects were presented in the spring of 2013, both at the SME/AeroDef Manufacturing Challenge Contest and at the College Senior Projects Competition Project Showcase. In the past, students participated in the SME/WESTEC event, where the requirement was the same.

Outcome D

- Participation at the Project Showcase event contributes to the improvement of this outcome. The senior projects in the culminating experience courses (MSE488A&B) are worked on in groups. The teams are multicultural and multidisciplinary, as the students come from different cultural and educational backgrounds. The students work together the entire two semesters (fall and spring) and they present their projects in national Manufacturing Challenge contests organized by SME and also at the annual in-house Project Showcase. Evidence that students have the ability to function productively on multicultural and multidisciplinary teams can be seen in their winning of top prizes in both of these contests.
- Participation at the Manufacturing Challenge Competition (SME/WESTEC and SME/AeroDef) contributes to the improvements of this Outcome. Participation at the TechFest event enables our students to function productively in multicultural environments. TechFest is attended by numerous students in the College with various ethnical and engineering and computer science backgrounds. In the process of visiting the different industry booths, students get to meet, talk and share experiences.

Outcome E

- Use of Performance Indicators in addition to the current assessment method for core courses taught in the spring of 2013.

Outcome F

- Participation at the Project Showcase event contributes to the improvement of this Outcome. Ethics and professionalism are emphasized across both semesters (fall and spring) for students in the senior design courses (MSE488A&B). Student teams winning top prizes at both the SME national Manufacturing Challenge contest and at the in-house senior design Project ShowCase is proof of achieving their ability to understand, practice and nurture professional and ethical responsibilities
- Participation at the TechFest event enables our students to understand, practice and nurture professional and ethical responsibilities, since students talk to employers who oftentimes are alumni themselves from the College of Engineering and Computer Science. They also get a better understanding of how important ethics is in industry.

Outcome G

- Use of College-designed rubrics for Written and Oral Communication and Teamwork for core BS courses.
- Use of Performance Indicators in addition to the current assessment method for core courses taught in the spring of 2013.
- Participation at the Project Showcase event contributes to the improvement of this Outcome. Students in the senior design courses must prepare a final project report and present it at both the SME national contest and the in-house Project Showcase. Student teams winning top prizes at both the SME national contest and the in-house Project Showcase is proof of achieving an ability to communicate effectively in both the written and spoken modes. Sample evidence comes in the form of their written reports and their PowerPoint presentations.
- Participation at the Manufacturing Challenge Competition (SME, WESTEC and AeroDef) contributes to the improvement of this Outcome.
- Participation at the TechFest event enables our students to communicate effectively in both the written and spoken modes. Students are offered Resume Workshops from the Career Center before the event, thus improving their writing skills. On the day of the event, students have to talk to the industry representative and explain their background, professional skills, knowledge and interests. TechFest also has conference sessions, where industry personnel make presentations. On this

occasion, students can observe good PowerPoint presentations and how to deliver the information in the most effective way. This helps students improve their verbal communication skills.

Outcome H

- Participation at the Project Showcase event contributes to the improvement of this Outcome. Students in the senior design courses (MSE488A&B) work on projects or systems that provide solutions in global and societal contexts. For example, in AY 2012-2013, one of the student teams worked on an assisted gripping system for people having limited mobility in their hands. Projects such as this one help students learn the intellectual and educational breadth necessary for understanding the impact of manufacturing systems engineering solutions in global and societal contexts.
- Participation at the Manufacturing Challenge Competition (SME, WESTEC and AeroDef) contributes to the improvement of this Outcome.
- Participation at Techfest exposes our students to various industries, thus offering them a better understanding of the impact of engineering solutions in global and societal contexts.

Outcome I

- Participation at the Project Showcase event contributes to the improvement of this Outcome. The recognition of the need for professional currency and an ability to engage in perpetual learning are addressed during the entire two semesters of the senior design classes. Student teams winning top prizes at both the SME national contest and at the in-house Project Showcase is proof of achieving this outcome.
- Participation at the Manufacturing Challenge Contest (SME/WESTEC and SME/AeroDef) contributes to the improvement of this Outcome.
- Participation at the TechFest event enables our students to engage in lifelong learning. By visiting the various industry booths and attending the conference sessions, students become aware of how important keeping professional currency is, find out about the newest advancements in engineering and realize that they have to continue learning even after they graduate. This makes them more able to engage in lifelong learning .

Outcome J

- Participation at the Project Showcase event contributes to the improvement of this Outcome. Students projects in the senior design courses (MSE488A&B) deal with contemporary issues in society, as well as those of the profession. For example, one student team worked on an assisted gripping system for people having limited mobility in their hands. Working on projects such as this helps students achieve this Outcome.
- Participation at the Manufacturing Challenge Contest (SME, WESTEC and AeroDef) contributes to the improvement of this Outcome.
- Participation at the TechFest event enables our students to understand the knowledge of contemporary issues in society. Exposure to various industries represented at the event increases students' knowledge of contemporary issues in society.

Outcome K

- Participation at the Project Showcase event contributes to the improvement of this Outcome. Students in the senior design courses (MSE488A&B) are taught to use the contemporary techniques, skills and tools necessary for effective manufacturing systems engineering practice. Student teams winning top prizes at both the SME national contest and the in-house Project Showcase competition is proof of achieving this Outcome. Samples of the students' final reports can be considered as evidence.
- Participation at the Manufacturing Challenge Contest (SME/WESTEC and SME/AeroDef) contributes to the improvement of this Outcome.

Outcome L

- Improve the level of machining skills and ensure safety in the heavy duty manufacturing labs (e.g. MSEM lab JD1128 and College Machining Shop JD1615). Starting in the fall of 2012, the College initiated an intensive machining free workshop (3days, 8 hours/day) in which students need to pass the training in order to be allowed access to the machining lab.
- Increase the use of software such as MS Excel in several courses.
- Participation at competitions (national SME competitions and in-house Project Showcase) with group projects improves this Student Outcome. Students in the senior design courses study and analyze different types of materials to be used in their

projects. This will enable them to understand the behavior and properties of materials as they are altered and influenced by processing in manufacturing.

Outcome M

- Participation at the Project Showcase event contributes to the improvement of this Outcome. Students in the senior design courses (MSE488A&B) use various design tools such as AutoCAD and SolidWorks for the design of products, and the equipment, tooling and environment necessary for their manufacture. Student teams winning top prizes at both the SME national contest and the in-house Project Showcase competition is proof of achieving this Outcome.
- Participation at the Manufacturing Challenge Competition (SME/WESTEC and SME/AeroDef) contributes to the improvement of this Outcome.

Outcome P

- In MSE248/L, CAD design examples were discussed before assigning related homework projects, which inspired student learning.
- In MSE248/L, the discussion of the final project was started earlier; thus, students could have time to discuss the project with earlier. The instructor will continue to introduce final project issues and ask students to start to think about new designs as early as possible.
- In MSE409, students received more CNC operator training before running a program; they also learned how to use FADAL and HASS machines.
- The team size in MSE410 was made smaller since we have more available equipment for the students in the class.
- A section on the setting up of parts was added to the MSE410 course, which had the students discuss how to make their parts before machining. This provided them chances to consider alternatives for approaching near-optimal solutions and helped them learn lab assignments clearly in order to improve their learning experiences.

4. Assessment of Previous Changes: Present documentation that demonstrates how the previous changes in the program resulted in improved student learning.

See 3g the documentation that demonstrates how the action items resulted in improved student learning.

5. Changes to SLOs? Please attach an updated course alignment matrix if any changes were made. (Refer to the Curriculum Alignment Matrix Template, http://www.csun.edu/assessment/forms_guides.html.)

No changes were made in the course alignment matrix at this point.

6. Assessment Plan: Evaluate the effectiveness of your 5 year assessment plan. How well did it inform and guide your assessment work this academic year? What process is used to develop/update the 5 year assessment plan? Please attach an updated 5 year assessment plan for 2013-2018. (Refer to Five Year Planning Template, plan B or C, http://www.csun.edu/assessment/forms_guides.html.)

The 5-year assessment was very useful in planning the various activities to enhance student outcomes. Since the department is very busy with the upcoming ABET visit, no update has been made for the 5-year assessment plan for 2013-2018.

7. Has someone in your program completed, submitted or published a manuscript which uses or describes assessment activities in your program? Please provide citation or discuss.

None

8. **Other information, assessment or reflective activities or processes not captured above.**

During academic year 2012, three new faculty and chair participated at ABET workshop.