To: Robert G. Cooper, Ph.D., Associate Vice President for Undergraduate Studies
   San Jose State University

From: Dr. Willie E. (Skip) Rochefort, Associate professor of Chemical Engineering
   Oregon State University

Date: June 04, 2007

Re: External Review of the SJSU Master of Science in Engineering (MSE) Program
   Visit dates February 19-20, 2007

Initial and Boundary Conditions
1) The program external review was conducted at the official invitation of Dr. Robert G. Cooper,
   Associate Vice-President for Undergraduate Studies in a letter dated December 14, 2006.

2) The program to be reviewed is the San Jose State University Master of Science in Engineering
   (MSE) in the College of Engineering Graduate and Extended Studies, under the direction of
   Associate Dean Dr. Ahmed Hambaba.

3) The review was conducted for the on-campus MSE program only, under the direction of Dr.
   Michael Jennings.

4) The review was conducted with a 1 ½ day visit to the SJSU campus on Feb. 19-20, 2007. The
   itinerary for that visit is included as an attachment to this report for reference.

5) The Program Self-Study Report for the Master of Science in Engineering Program (Fall 2006)
   was provided to the reviewer approximately one-month prior to the review dates.

6) Information about SJSU and the MSE program was also obtained from the following web sites:
   College of Engineering (http://www.engr.sjsu.edu/) and Graduate and Extended Studies
   (http://www.engr.sjsu.edu/ges/)

7) In the initial meeting with a committee of Administrators (see schedule), it was suggested that the
   review focus in particular on several key questions. Those were:

   I. Overall Value of the Masters of Science and Engineering (MSE) Graduate Program

   II. Curriculum, Students, Faculty, and Assessment of Learning Outcomes

   III. Resources, Program Planning, and Strategies: Sustainability of the MSE program in the current
       model, including how to handle the emphasis (option) areas.

   These will serve as the topic areas of focus for the review and recommendations.
Summary

I. Overall value of the Masters of Science and Engineering (MSE) Graduate Program

My overall assessment of the SJSU MSE program is that it is a unique program in the country and could become a national model for industry masters programs. I know of several programs in the country with a similar scope (Keck Graduate Institute in LA, Northwestern University Industrial Masters program in Biotechnology, University of Oregon Materials Science Institute industrial masters program in Chemistry), but none appear to do quite the same, as well, and with such a large scope. Below are some specific comments.

1) The MSE program is different than most other MS in Engineering programs I am aware of due primarily to the student group projects, which have a strong industrial focus and are intimately connected with an industrial partner. This is truly a program differentiator in the country! The fact that SJSU is located in the Silicon Valley, with access to so many and such varied industrial partners, allows the MSE program to have industrial interactions and programs that not many schools could support. In fact, it appears that the MSE program is the perfect “business model” for how SJSU overall can and does differentiate itself as a University with it’s strong community ties.

2) The close industrial interactions have the following benefits:
   - value to the students to work on real industrial problems and to network in the local industries.
   - value to the local industries to get teams of 3-4 bright, highly motivated students (many of whom are working or already have industrial experience) to work on problems that they might not have the internal resources or personnel to address.
   - value to faculty mentors involved with these projects to network with the local industries, which may lead to longer term joint projects.
   - value to SJSU to be viewed as a close community technology partner.

3) Another obvious value of the MSE program to SJSU is that it is truly a revenue source. With a student body of 500-600 just in the on-campus program, almost all of which are paying their own ways (not research funded), the MSE program represents a significant resource stream, and it appears to have the ability to continue to grow if SJSU is willing to make investments in the program.

4) The program director must be diligent in keeping the quality MSE degree at its current high level. Since this is a rather “unique” degree (as in it is not the typical individual student research thesis based degree), it is important that employers and evaluators (the academic community) clearly understand that the MSE degree is rigorous and that the even though the student capstone projects are in a group format, there is strong individual accountability in the program structure. This requires a strong set of core classes, and oversight by faculty mentors and the program director in all the industrial interactions. This is also very important to maintain the “reputation” of the program in the industrial community. Well prepared students become good employees and are the best currency to build and maintain a the MSE program reputation.
II. Curriculum, Students, Faculty, and Assessment of Learning Outcomes

A. Curriculum
- There must be a strong core curriculum that differentiates the MSE student from the other degree programs. The ENGR 201 (Statistics and Math), ENGR 202 (Systems Engineering), ENGR 203 (Managing Engineering and Technology) appear to be a strong core that are currently taught by competent and committed faculty. It should be noted that the quality and commitment of faculty teaching these course must be maintained.

- As is often the case in core courses in any engineering discipline, the students don’t always see the value or connection of the core classes to their final goal as they are taking the classes. This is evidenced in some of the student surveys taken at various points in the student’s academic career. There should be an effort made to tie the core classes to the final project by making the connections early on in the program and then reinforcing these connections in the students’ final term. I heard comments from the teaching faculty that this was one of the goals they were working towards.

A.1 Options: There were a lot of questions around how to handle the option programs within MSE. Below are some of the questions and my thoughts on how to handle them.

a) Should the options be “incubated” in MSE and then moved to departments when they are mature or should they stay in MSE. The answer to this is that probably some of both would work best. There are certainly some specialty areas which are of particular interest to existing departments, would have faculty champions from those departments, and would be a natural fit in the department once they had matured. In this case, the option should be transferred to the department.

b) Some of the specialty options that are developed (such as Bioengineering for example) don’t have one natural home at the university (because they are highly interdisciplinary in nature) and would be better served by staying in MSE. Of course, this means that MSE must be given the faculty support (released FTE) and resources to maintain these option programs.

c) How many option programs? There should be an effort to consolidate options, leading to larger cohorts of students, faculty, and industries, rather than to let them proliferate into smaller fragments with fewer students, faculty, and industries involved. For example, at Oregon State University we had as many as 10 “transcript visible options” in Chemical Engineering several years ago. Some options had only 2-3 students. Each option had a different set of option classes, with a slightly different core. It became a nightmare for the students and faculty advisors to administer, and when industries would hire students it added little “value” to the process and outcomes. We reduced from 10 to 4 options (biochemical, environmental, materials/microelectronics, nanotechnology), with a larger student cohort in each option. Now students, faculty, and industries are better able to understand the options and their value in the workplace.
B. Students
- There appears to be an almost endless pool of students for this program, with many of these coming from foreign countries. While the current MSE staff of a program Director (Michael Jennings) and an administrative assistant (Kathy Robinson), perform a truly Herculean task with student advising and tracking, it is clear that they need some more staffing if the program is going to thrive. This will be addressed in the sustainability section.

- Student selection in itself is a huge task, and with so many applying and so many in the program (500-600 students is what I heard), providing individual academic and project counseling appears to be difficult.

- Students interviewed (alumni) expressed generally very positive opinions with the attention they had received from program administrators. However, I cannot see that this continue to be the case as the program grows if more support staff is not added

C. Faculty
- The current faculty I interviewed were highly committed to the program, expressed a strong interest in keeping it going, were very favorable about their student interactions (committed students was mentioned several times), and also in some cases (especially for the project mentors) saw it as a great opportunity for them to network with local industries (and with former students that move into local industries).

- Faculty must be properly compensated for their time by allotting the appropriate level of FTE for their program involvement. This should include option “champions”. There are two models here: 1) Hire faculty directly into the MSE program, which is a large resource commitment (but may be warranted in the long term). 2) Provide current faculty in various departments with sufficient release time (FTE) to participate in the program.

- Faculty Performance Evaluations, however they are performed, should include a component related to participation in and support of the MSE program if this is a significant portion of the faculty effort.

D. Assessment of Learning Objectives
- There appears to be a strong commitment to assessment of learning outcomes across the program. It looks very similar to the undergraduate level ABET assessment which we do at OSU (and which most other Engineering schools use at the undergraduate level, although OSU currently does not do this at the graduate level).

- There are several areas that need to be attended to: longitudinal tracking of the students during the program, and alumni with a feedback loop into the program to adjust learning outcomes; industry feedback into the program should more rigorously be pursued, and in particular each industry representatives/mentors for the student projects should be interviewed for feedback.
III. Resources, Program Planning, and Strategies: Sustainability of the MSE program in the current model, including how to handle the emphasis (option) areas.

The sustainability of the MSE program with its current level of staffing and support was the biggest area of concern that I had in my visit. As mentioned in my opening comments, it was clear to me that this was a program with high value to SJSU and the Silicon Valley technological community. However, to maintain the integrity and viability of the program, there needs to be an investment in the program Administrative Support Structure. This can take different forms depending on the direction that SJSU chooses to take this program, but I should emphasize that I feel strongly that an investment is the MSE program will surely bring rewards to SJSU.

I will offer some general thoughts of what I view as program needs in the proposed model structure.

Proposed MSE Administrative Support Structure (Rochefort Model)

*Associate Dean Graduate and Extended Studies* (currently Dr. Ahmed Hambaba)
- Administrative Specialist

*MSE Program Director* (possibly Department Head level - currently Mike Jennings)
- Administrative Specialist (currently Kathy Robinson)
  - a) Administrative Coordinator (on-campus programs)
    - student workers for filing, data tracking, etc.
  - b) Counseling Center with Academic Advisor (general program student advising).
- Faculty Advisory Group (Option Champions – should be compensated—*see Models below)

Primary responsibility
1) Advise Program Director on all aspects of MSE, including curriculum, students, options, etc. and act as an oversight committee and campus representatives from the Engineering community.
2) Coordinate student advising in their individual option programs.
3) Initiate and maintain industrial contacts for their option.
4) Coordinate student projects in their option.
5) Report to MSE program Director, Administrative support, and MSE option faculty on the status of their option (student numbers, industrial affiliates, etc.). Essentially provide comprehensive tracking for their option.

* Option Champion Compensation Models (these steps should be considered depending on growth and direction of the MSE program)
Step #1: Compensate faculty at 0.125 FTE to be option champions
Step #2. Move compensation to 0.25 – 0.5 FTE for certain large options and interested faculty
Step #3. Hire tenure track faculty directly into MSE program.