Ohlone College
Program Review Report

- **Program Description and Scope:**
  1. *Program Review Title:* Engineering
  2. *Academic year:* 2012/2013
  3. *Review Type:* Instructional Disciplines
  4. *Program/Departments:* Engineering (09001)
  5. *Authority Code:* 44-Dean, Science, Engineering, and Mathematics
  6. *External Regulations:* Yes _ No X
  7. *Provide a brief narrative that describes the instructional program/discipline.*

The Engineering Department at Ohlone College under the Science, Engineering, and Mathematics Division offers lower-division engineering or pre-engineering program that allows students to complete their upper-division engineering requirements for a baccalaureate degree program in engineering disciplines such as Industrial, Mechanical, Electrical, Civil, Chemical, Aeronautical, Computer engineering, etc. Ohlone College also offers an Associate of Science (A.S.) degree in engineering as well as a Certificate of Accomplishment.

8. *Describe how the program specifically serves students, faculty and staff.*

Both the transfer and the A.S. program provide higher level math and physics, foundation engineering courses, and allow a smooth transition to many of the engineering majors at schools such as San Jose State University, Cal Poly, San Luis Obispo, and UC Berkeley, Davis, etc.

9. *Describe how the program addresses current needs and applies current technologies.*

Feedback from former students indicated that Intro to Engineering offers valuable training and perspective. In addition, major changes have been made to the Introduction to Engineering course to introduce students to working on projects in teams. This is following a move at many 2 and 4 year colleges and universities across the country to help retain and better prepare engineering students for future success.

10. *Discuss the impact of the program on the college and/or other programs.*

Although the Engineering Department is small by itself, most of the higher level math classes as well as physics and possibly chemistry are taken by engineering students. If the engineering program were to disappear, these other departments may be greatly impacted as students would most likely take these courses with their engineering classes at other schools.

11. *Discuss the impact of the program on the community and the impact of the community on the program.*
Ohlone College is a part of the Ohlone Community College District with campuses in Fremont and Newark, as well as the virtual campus of online course offerings. Ohlone College serves six high schools, two continuation high schools, two adult schools, and the Regional Occupational Program. Ohlone is proud of its role in the community college system - both in the United States and California - and honored to be able to provide its students with a quality educational experience.

• **College Mission**

1. **Mission Statement**

   The mission of Ohlone College is to serve the community by offering instruction for basic skills, career entry, university transfer, economic development, and personal enrichment for all who can benefit from our instruction in an environment where student learning success is highly valued, supported and continually assessed.

2. **Vision Statement**

   Ohlone College will be known throughout California for our inclusiveness, innovation and superior rates of student success.

3. **Core Values, Goals & Objectives:**

   **College Core Values**

   • We open access to higher education and actively reach out to under-served populations.
   • We maintain high standards in our constant pursuit of excellence.
   • We promote team work and open communication.

   **College Goals/Objectives**

   1. Through innovative programs and services, improve student learning and achievement.
      
   1. By 2013, have in place an ongoing system for identifying and assessing student learning outcomes at the program and course levels, which includes faculty dialogue and appropriate improvement plans.

   4. Briefly describe how the program supports the college mission, vision selected college values.

   The Engineering program utilizes methods and technologies that hold the most promise for improving student course and program completion success rates. The following teaching strategies are emphasized.

   Hands-on activities using the types of equipment central to engineering.

   Design projects
   Laboratory exercises
   Active learning methods (brainstorming, teambuilding)

   The engineering department focuses on strategies which increase the proportion of fulltime students including learning communities, enhanced facilities, and improved course availability with particular emphasis on:
Enhanced lab facilities
Improve course availability
Recruitment and retention of women
Expand existing laboratory courses to include hands-on exercises

The primary focus of Engi 101 "introduction to Engineering" is to introduce students to hands-on projects and to introduce an understanding of the engineering design process using active learning skills. Students are taught and encouraged to use a team approach to problem-solving. By using the tools taught in the separate computer applications class, they will be able to present their results both orally and in written reports.
By blending all these elements together - i.e., hands-on, teamwork, computer applications, communications skills - students will be prepared to start their working careers as effective

A focus of the Engi 130 "Electric Circuits" and Engi 140 "Materials Engineering" courses is to provide students with a rich hands-on laboratory experience. While helpful to all students, studies demonstrate that hands-on laboratory experiences are particularly helpful in building morale and self-confidence in underrepresented groups of students.

Emphasis is placed on teamwork. Students are taught to value different points of view in a supportive environment of mutual respect. Thus the Engineering program is promoting team work and open communication while promoting diversity and inclusiveness.

5. Briefly describe how the program supports selected college goals.

The engineering department strives to offer courses which improve student learning and achievement.

6. Briefly describe how the program supports selected college objectives.

A system is being implemented for the assessment of course SLOs. This includes faculty dialogue and improvement plans.

- Program SLOs & Assessment
  1. Program SLO -

    Employ general principles, theories, concepts and/or formulas in the solution of problems.

    a. Indicate program assessment strategies used.
       i. Performance Assessment
       
    b. Describe the criteria and standards used to appraise student work.
> 90% = excellent

> 80% = good
> 70% = fair
> 60% = poor

c. Enter assessment results and analyze student success in achieving this program SLO.
   
   See attached

d. Describe revisions in curriculum or teaching strategies implemented to promote student success.
   
   See attached

e. Future Action (Improvements)
   
   Maintain current student learning plan

2. Program SLO -

Contribute productively to the success of a team in an engineering project.

a. Indicate program assessment strategies used.
   
   i. Performance Assessment

b. Describe the criteria and standards used to appraise student work.

   The ability to work in teams is crucial in any area of life – be it personal or professional. The students on this project gained an understanding of the kinds of problems that can come up in teamwork. The teams that happened to have dedicated members had very satisfying experiences. The ones that didn’t often had someone who sat around quiet, frustrated, or didn’t show up. But regardless of the problems, every team came up with a presentation and a design. The ones that were there realized that they had to perform and they got the job done. I think it was a valuable learning lesson for all. The students that were graded as unsatisfactory by the group were subsequently dropped from the course right after the presentations were completed.

   Although this will be very time-consuming, it is important that more research be done on how to help students deal with some of the issues that can develop in teams. There is much literature on the web that should be sifted through and experimented with to see what works. Perhaps setting up 10-minute clinics with each of the teams to see what is working well and what isn’t would be useful. Another possibility is to allow teams to “fire” nonparticipating members. To stay in the class, the member would have to find another team to work on.

   The next time this course is offered, teams will be formed immediately so that they have more time to “gel”. Also, students will be dropped immediately after they exceed the required number of absences. In other
words, they will be “fired”, just like they would on any job. Teams will recover, and won’t be held back by others. If need be, the teams will be realigned. This is an excellent skill for students to know and it is important that it be introduced into the engineering curriculum as soon as possible so that students can work together more effectively as teams in laboratory experiments, other course projects, etc. This will help students immensely in the long run and is worth the effort now at the community college level. It is vital that the faculty teach the most effective ways to empower our students.

c. *Enter assessment results and analyze student success in achieving this program SLO.*

Assessment data to be gathered in 2013 from the ENGI 101 classes.

d. *Describe revisions in curriculum or teaching strategies implemented to promote student success.*

Yet to be determined.

e. *Future Action (Improvements)*

Maintain current student learning plan

- **SLO Matrix**

  *Key: I-Introduced, P-Practiced with Feedback, M-Demonstrated at the Mastery Level*

<table>
<thead>
<tr>
<th>Course</th>
<th>SLO-1</th>
<th>SLO-2</th>
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</thead>
<tbody>
<tr>
<td>ENGI 101</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>ENGI 101</td>
<td>I</td>
<td>P</td>
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<tr>
<td>ENGI 115</td>
<td>M</td>
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<tr>
<td>ENGI 120</td>
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<tr>
<td>ENGI 130</td>
<td>M</td>
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<tr>
<td>ENGI 140</td>
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- **SLO Matrix Comments**

- **Course SLO & Assessment**

  **ENGI 120 Engineering Mechanics - Statics**

  1. Analyze forces in two- and three-dimensional structures.
  2. Draw free-body diagrams.
  3. Find centroids utilizing integration techniques.
  4. Analyze trusses, frames, and simple machines.
  5. Calculate distributed moment forces.
  6. Discuss the scientific method as it pertains to various engineering situations.
  7. Perform unit conversions; perform high level calculations pertaining to engineering problems and applications.

<table>
<thead>
<tr>
<th>Indicate planned course assessment strategies</th>
</tr>
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<tbody>
<tr>
<td>Performance Assessment</td>
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</table>

Describe the criteria and/or performance standards used to appraise student work.
See attached

Enter assessment results and analyze student success in achieving course SLOs.

See attached

Describe revisions in curriculum or teaching strategies implemented to promote student success.

The student performance is a bit disappointing. Individual students did exceptionally well but the overall average of all students completing ENGI 120 is not impressive. This does not take into consideration the students who dropped the class, making the overall performance even less satisfactory.

Future Action (Improvements)

Maintain current student learning plan

Currently the lack of any full time engineering faculty is not ideal. When there is sufficient funding to have at least one full time instructor who teaches at least one engineering course, the vision and leadership of this individual will have a positive impact on student success.

Student Achievement: A series of measures including course completion, course retention, persistence, program completion, and others.

1. List expected student achievement outcomes:

2. Analyze changes in data, identify trends, and provide possible contextual explanations for each measure used. (Example measures include: course completion, course retention, persistence, program completion).

There was an upward trend in enrollments starting when a full time engineering instructor was hired. But sadly he was laid off several years ago due to budget cuts. Unfortunately, this encouraging upward trend did not continue. The success rates are at a respectable 83.9% overall. Sadly, the success rate of the Hispanic students dropped to 64.3%, far lower than other demographic segments.

3. Analyze program budget trends and expenditures. Comment on how the program can best use budget resources.

The engineering department received $2000 for new oscilloscope components and for more robotic parts. This was helpful. When the budget situation eases up, more equipment will certainly help attract students to the program. When the new Science Center is built, we feel this will provide the level of safety and atmosphere conducive to learning.

4. Analyze the program's current use of staff, equipment, technology, facilities, and/or other resources. Comment on how the program can best use these resources.

Currently the lack of any full time engineering faculty is not ideal. When there is sufficient funding to have at least one full time instructor who teaches at least one engineering course, the vision and leadership of this individual will have a positive impact on student success.

5. Describe any additional notable program achievements (optional).

6. Additional Program Table Data
7. Future Action

- **Program Analysis**
  After assessing student learning outcomes/impacts, student/program achievement, and the status of previous program improvement objectives (PIOs), analyze the data and any identified trends, and summarize your findings. Use these data and trends to prioritize, revise, or develop new PIOs.

  1. *Describe program achievements and successes.*

     Preliminary findings indicate the need for the occupational/skills based courses to be taught together with the transfer track courses. Ohlone students' financial circumstances have a very real effect on their decisions. Students are often not able to afford to finish their baccalaureate degree without first becoming employed as a technician in order to pay their expenses and acquire on-the-job experience. In addition, some students who are initially on the transfer track discover that the occupation/technical track is better suited to their talents; vice versa, students may try a occupational course and later decide to transfer to a university for a 4-year degree. Therefore, it is imperative that students be able to take both types of coursework on the same facility. By sharing equipment, there is great savings in equipment and faculty, hence increased efficiency and economy.

  2. *According to the evidence, what are the areas needing improvement?*

     There needs to be increased efforts to assure the success of underrepresented populations, notably Hispanic/Latinos. This can be achieved by creating cohorts, providing tutoring, peer mentors, and internships.

- **Program Improvement Objectives:**
  1. **Objective:**

     Modernize and upgrade the Engineering and Engineering Technician programs so they are better aligned with current trends in industry.

     Three prong approach:
     * **Clustering**
       Highest priority -- the courses for both the transfer track and the occupational/technical track must be taught together on the same campus. Also, all the science courses must be clustered together in one building -- this increases collaboration, sharing of equipment, and synergy. Students are able to better appreciate how the difference science disciplines are interrelated and overlapping.

     * **Faculty**
       Since the engineering instructor and one physics instructor have now retired, this position should be replaced by a full-time hire who teaches both engineering and physics.

       Engineering Department urgently needs at least one full-time engineering faculty.
A full-time person would provide leadership. It is unreasonable to expect part-time instructors to shoulder the duties of assessment and curriculum development. A full time instructor would give stability and consistency to the program and lead to real, substantive improvements in curriculum. It would still be wiser to hire several part-time instructors each with expertise in one area of engineering; it is unlikely that one instructor will possess expertise in all the branches—mechanical, civil, chemical, materials, electrical, and industrial.

Modern advances have blurred the divisions between the disciplines. No longer is it appropriate for subjects to be in "silos", separate from one another. New technologies such as nanotechnology are developed upon a foundation of all the sciences: physics, engineering, chemistry and biology. To help our students and to make courses relevant for the needs of industry, we must maximize collaboration, sharing, and team-teaching across departments.

* Facilities
The technology and equipment must be updated; labs and classrooms are in grave need of renovation so that there is adequate, safe space for students to conduct experiments and engage in interactive learning. Much of the equipment currently used in engineering is old, patched, and outdated. The new facilities must maximize collaboration and collegiality between the departments.

a. Action Plan

Year 1:

The curriculum of both the Engineering and the Engineering Technician Programs will be expanded and modernized, to be better aligned to the demands of industry. Meaningful, relevant laboratory activities will be developed which place high priority on both hands-on skills as well as theoretical knowledge. Equipment needs to be updated. Technology needs to be improved and modernized. Facilities must better serve student needs in keeping with modern safety codes. It is critical that the occupational/skills-based courses be taught on the same site as the transfer track courses for the following reasons:
* equipment, faculty, and technology may be shared
* students learn to appreciate the value of integrating both the theory and the hands-on expertise -- that one compliments the other
* By having transfer faculty work together in close proximity to career/technical faculty members there is increased, communication, collaboration and team-teaching. Faculty build understanding, mutual support, and shared goals.

Year 2:

Additional technology and equipment is added to the laboratory curriculum for engineering courses and for Engi Tech courses:
Maintenance and service for existing equipment  =  $6,000
Year 3:

Additional technology and equipment is added to the laboratory curriculum for engineering courses and for Engi Tech courses:

- Laptops
- Electronic meters, rectifiers, electronic components for student projects and experiments $1,600
- Maintenance and service for existing equipment = $6,000

b. Staffing

Year 1:

It is critical that there be a technician present in the evening hours. This is the time when a part-timer is on campus teaching lab classes till 9 or 10 pm. If a part or a reagent is missing, the part time instructor may not be able to find it in the stock room. He would need to abandon his class while he searches for the missing item. If an unsafe situation arises, the part time faculty may not know what to do. This evening technician may be shared with other science classes taught in the evening, if all the classes are located in close proximity (i.e. in a Science Center).

It is urgent that we hire a full-time faculty member who is qualified to teach in at least two of the following three areas:

- engineering
- physics
- astronomy

Hire a part-time industry liaison to coordinate job placement, internship, curriculum development for all STEM programs.

Year 2:

Continue to employ personnel listed for Year 1

Year 3:

Continue to employ personnel listed for Year 1

c. Equipment (Include items that fit under department budget codes)

Year 1:

The Engineering program uses Lego Mindstorm robotics kits as part of the ENGI 101 Introduction to Engineering course. While each kit comes with one light sensor, many robot designs require an additional light sensor, and we are therefore interested in purchasing an additional sensor for each of 16
Mindstorm kits. Hence, we need 16 Light Sensors (Lego item # 9844) from http://shop.lego.com (Lego Systems, Inc) at a total price (including tax and shipping) of $264.34.

Year 2:
Assorted replacement capacitors, rectifiers, meters and components needed for electrical engineering to replace the ones that wear out. $3,000

Year 3:
Assorted replacement capacitors, rectifiers, meters and components needed for electrical engineering to replace the ones that wear out. $3,000

d. Technology (Include items that fit under IT budget codes)
Year 2:
Provide set of 24 computer laptops and software for new Science Center $30,000

Year 3:
Provide additional components and upgrades for AFM and SEM, both hardware and software $30,000

e. Facilities (Include items that fit under the Facilities budget codes)
Year 1:
Laboratory facilities are required which meet modern safety codes. There needs to be adequate space for several groups of students to be working simultaneously on etching, polishing, and other techniques of sample preparation and testing. These procedures require running water, fume hoods, and ovens.

Year 2:
There will be need for additional equipment for use with the testing equipment as well as the AFM, SEM, and other microscopy methods. Plumbing and storage must be upgraded. There needs to be a bigger lab where more students can work together on the same task. Build a bigger storage space which includes waste collection vessels. Build a work space for the engineering technician, including an office with a desk.

Year 3:
Begin construction on the new science center, which will allow for the
various science and technical disciplines to work together (including both transfer and occupational sharing the same building).

f. Other (Include other resources needed)
Year 1:
CRITICAL -- the occupational/skills-based courses must taught on the same site as the transfer track courses for the following reasons:
* equipment, faculty, and technology may be shared
* students learn to appreciate the value of integrating both the theory and the hands-on expertise -- that one compliments the other
* among faculty by putting faculty daily close proximity, this fosters increased collaboration in team-teaching and curriculum development.

Maintenance and service for existing equipment = $6,000

Year 2:
Maintenance and service for existing equipment = $6,000

Year 3:
Maintenance and service for existing equipment = $6,000

g. Assessment Plan: List Assessment Strategies
Year 1:
1. Test questions will be imbedded which indicate students' level of proficiency in the use of various appropriate problem solving, and ability to use equipment.

2. Engineering Industry Advisory Committee -- members will review facilities, equipment, and curriculum to assess the relevance and to recommend improvements.

Year 2:
Continue the work described in Year 1

Year 3:
Continue the work described in Year 1

h. Which college goal(s) does this program improvement objective work to
achieve? Clearly describe how your PIO will help achieve one or more of the college goals and objectives, has impact beyond the particular department, and contributes to student learning/success.

1. Through innovative programs and services, improve student learning and achievement.

Rationale:

The proposed recommendations -- additional faculty, safer facilities, updated equipment and technology to more closely reflect the needs of modern engineering -- the curriculum will better prepare students for employment trends.

2. Support the economic vitality of the community through educational programs and services that respond to identified employment needs.

Rationale:

The proposed recommendations -- additional faculty, safer facilities, updated equipment and technology to more closely reflect the needs of modern engineering -- the curriculum will give Ohlone students the skills and training they need for success on the job.

2. PIO Assessment

   a. Enter assessment results with analysis.

      See attached

   b. Describe how PIO achieved one or more of the college goals and objectives, had an impact beyond the particular department, and contributed to student success/learning.

      Certainly it is commendable that Ohlone College has maintained the level of quality and achievement in light of the badly outdated equipment and the fact that there are no engineering courses offered at Ohlone which are taught by full time instructors. Ohlone's part time instructors are admirably talented, but their talent is stretched very thin since they are on campus only 6 hours per week.

   c. Analyze the impact of reallocation or addition of resources. If money or resource was not used, give rationale.

      The $2,000 grant for additional components to Ohlone's elderly oscilloscopes certainly did help the ENGI 130 students because this shortened their wait time to get hands-on experience. Likewise the grant also funded additional LEGO robotic parts for ENGI 101.

   d. Future Action

      Current level of focus maintained. Describe.
Certainly Ohlone will continue to focus on maintaining the level of rigor and hands-on experience, thanks to our exceptionally talented pool of part-time engineering instructors.

Currently the lack of any full time engineering faculty is not ideal. When there is sufficient funding to have at least one full time instructor who teaches at least one engineering course, the vision and leadership of this individual will have a positive impact on student success.

1. **Objective:**
2. **PIO Assessment**
   a. *Future Action*

- **Outside Review Results**
  1. List each team members name and title.
     None.
  2. Discuss key feedback provided by team and how it was incorporated into the report.
     None.

- **Attached Files**
  1. [Data for Engineering.pdf](Data for Engineering.pdf)
  2. [ENGINEERING ASSESSMENT.xls](ENGINEERING ASSESSMENT.xls)