College of San Mateo

2018-19 CTE Instructional Program Review

First name Jose   Last name Gutierrez   Email gutierrezj@smccd.edu

Program Name

Please select your program

Engineering

Division

Please select your division

Math/Science

Submission Date

1a. Provide a brief description of the program and how it supports the college's Mission and Values Statements, its Diversity Statement, CSM's and SMCCCD's Strategic Plans, and the college's Educational Master Plan. You may also discuss any factors that have impacted the program and its enrollment. Include changes in student populations, statewide initiatives, transfer requirements, advisory committee recommendations, legal mandates, workforce development and employment opportunities, and community needs.

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

The engineering program provides the lower division engineering classes necessary for transfer to baccalaureate programs in various engineering fields. Though occupational demand in specific fields fluctuates over time, engineers and the problem-solving skills developed through an engineering education are considered critical to the region's economic development. The engineering program supports Strategic Goal 2: Promote Academic Excellence by providing transfer into baccalaureate programs that lead to employment in high demand, high wage occupations. The program also supports Strategic Goal 3: Develop Responsive, High-quality Program and Services, by preparing students for high-demand careers and by offering classes in both oncampus and hybrid modes. Engineering students typically take Math (251, 252, 253, 270, 275), Chemistry (210, often 220), and Physics (250, 260, 270). Depending on transfer school and major, students also take up to 6 engineering classes and up to 4 CIS classes along with general education requirements. Due to the continued diversification of lower division transfer requirements and the increased popularity of majors such as bio/biomedical engineering and environmental engineering, some students who transfer in engineering may not take any engineering courses. However, the presence of an engineering program may be part of what initially draws these students to CSM. Although the program offers an A.S. degree in engineering, the B.S. degree is considered necessary for work in the field and most students do not take classes beyond the many required for transfer. The program also offers a very flexible A.S. degree in engineering technology, which allows students to focus on a particular technical area.

2a. Describe the results of your previous Program Review's action plan.

f your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

Action Plan Item: Provide Student's with Project based learning
The Engineering has successfully implemented and will continue to increase its emphasis on project-based learning. The introduction of an electromechanical design component to ENGR 100, the use of a 3-D printer by the robotics and ENGR 210, and the purchase of new materials testing equipment have helped modernize and generate enthusiasm for the program. A design project has been added to ENGR 260, ENGR 230 and ENGR 260. These projects have successfully increased student engagement with the course material, as well as given our students an opportunity to increase their potential for getting hired for internships due to well packaged online design portfolio deliverables that they can share with employers. However, current facilities in building 19 remain insufficient -- in terms of space, equipment, and supervision -- to support projects of greater scope.

Action Plan Item: New Center for Innovation and Emerging Technology
The demolition of building 19 and the design and construction of a new Center for Innovation and Emerging Technology has not progressed. There is a need for multidisciplinary shared workspaces – for example, a "design space" equipped with whiteboards, multipurpose computer labs, and a "tech shop" to support prototyping. These workspaces could support project work outside of lecture and lab hours, allowing students to work in interdisciplinary teams and extend what they learn in the classroom to more advanced projects. Students would gain hands-on experience as they prepare for internships and transfer. Projects could go beyond what is currently possible in a single course, making it easier to attract support from local businesses and industry.

Action Plan Item: Hire new full time engineering faculty
A full time engineering faculty member has been hired and is currently in year 2 of tenure review.

2b. Program coherence and effectiveness: Explain any curriculum changes since last program review, including SLO alignments.

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

Since the last program review, Engineering has not added or dropped any course offerings. Course SLO's have been review by the new full-time faculty member and align with Statewide and Industry standards.

Student Success and Equity

File upload

Student success and equity.docx

2d. Provide an update on any long-term plans that are still in progress (if applicable).

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

NA

3a. Course and program assessment. Discuss the results of your program assessment. Explain any strategies, research, initiatives, curriculum development or other activities intended to improve student learning and promote educational equity in your discipline, either at the course or program level.

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

A. Curriculum review: Faculty reviewed the SLOs in the core courses, for coherence, cohesion and currency. All courses SLOs align with the program learning goals.
B. Student learning review: Faculty took a holistic view of student learning in the program using the following methods:
● Examination of student work: Faculty evaluated several key assignments, exams, and projects to assess the students retention of SLOs. Based on this examination, it appears that students are effectively leaning key concepts outlined in the courses SLO's. For example in evaluating ENGR 210's final project, students demonstrated successfully the ability to meet SLO's 1,2,3,4,5, and 7.
● Feedback from students. Student feedback was solicited on the effectiveness of the design projects, as a learning tool. While not statistical data was gathered generally students had positive experiences with project based learning activities, and felt it helped them contextualize course concepts.
C. Results: Faculty implemented the following:
● Increased the project based work, by adding a Truss Structure design challenge project to ENGR 230 which did not previously have a hands on project component to the course

3b. General Education / Institutional assessment. Discuss participation in any General Education, Core Competencies, institutional or interdisciplinary assessment activities.

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

Faculty in the department participated in several flex day activities on assessment, as well as participated in discussions on these topics at monthly Division meetings.

4a. Review the program's available labor market data, as applicable. Here are two relevant links:

- **State of California Employment Development Department, Labor Market Information Division (the official source for California Labor Market Information):**

- **Employment data (by Program Top Code) from the State Chancellor's Office**

Explain how the program meets a documented labor market demand.

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

The program market demand data shows continued demand for Engineering with an increase of 18,537 jobs in 2017. The Bureau of Labor Statistics projections for 2014-2024 show employment increase in the 2-8% range for most of the traditional engineering disciplines. The projected increases for environmental engineering, 12%, and biomedical

engineering, 23%, are significantly higher than the projected average, but – due to the small base – the projected increase in the number of jobs in each field (6800 for environmental engineering; 5,100 for biomedical engineering), is lower than that for mechanical engineering, 14,600 [Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, December 2015; links to specific disciplines at http://www.bls.gov/ooh/architecture-and-engineering/home.htm]. There has been an increase in the number of transfer schools offering programs in bioengineering and biomedical engineering and an increase in the number of our students seeking to transfer in these majors. In order keep up with demand we are continuing to look to grow the engineering program at CSM. The engineering program has received CTE funds to add needed rapid prototyping manufacturing equipment needed to keep our program competitive and offer CSM students real world manufacturing experience as part of the engineering curriculum.

4b. Summarize student outcomes in terms of degrees and certificates. Identify areas of accomplishments and areas of concern.

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

The number of A.S. in engineering is low (31 compared to the enrollment of students ~200), however this is to be expected due to the large course load for engineering students, and the need to receive a 4yr degree to work in the field. Students who transfer and complete a B.S. degree in engineering continue to find high-paying jobs that make visible contributions to society (for an interesting graphical display of college majors and employment, see http://www.census.gov/dataviz/visualizations/stem/stem-html/ including the "hover over" instructions at the bottom). Given the regional emphasis on STEM fields and the increased inclusion of engineering in the Next General Science Standards [http://www.nextgenscience.org], it is likely that interest in engineering among incoming students will remain strong. However, for the large fraction of students who arrive at CSM in need of precollegiate math, it may be difficult to persevere through a course of study that requires completion of precalculus and then 2 ½ to 3 years of additional study prior to transfer. The math program's introduction of a combined trig/precalculus class will be helpful in this regard. (http://collegeofsanmateo.edu/institutionalresearch/degcert.asp).

4c. Review and update the program's Advisory Committee information. Provide the date of most recent advisory committee meeting.

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

The Engineering Program does not have an acvisory board.

5a. Provide a brief description, including actions, measurable outcomes, and timelines

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

n order to gather more data on SLO's we plan on adding a student exit survey for each engineering course for students to assess whether their confidence that they have successfully learned items from the courses SLO's as well as their confidence in their own ability to apply the SLO's to solve real world engineering problems. With this data we would like to explore new ways to increase student efficacy, and retention of SLO's. We will report back in the next program review of the success or this goal.

Additionally the engineering program is looking to collaborate with the Drafting program, and the Library, to provide students with a makerspace to supplement students learning experience, provide them with critical thinking skills, and marketable technical skills.

5b. What will your program do to increase student success and promote student equity in the next two years? What kind of professional development and institutional support will be engaged and enacted to meet these goals?

If your answer is more than 2000 characters (approximately 300 words), please upload a Word document below (10 MB or less). If you're not sure, please upload your answer. Please upload text only; we cannot ensure that non-text such as images, diagrams, or charts will be retained in the final submission.

We would like to work with programs like Umoja to increase African American enrollment in the engineering program. We will partner with Mana in order to recruit Pacific Islander students to enroll engineering. Additionally we will continue to work with METas and MESA to ensure the continued success for Hispanic student population.

Additionally the engineering department is looking for potential opportunities to collaborate with the year 1 promise program to boost minority and women enrollment in the engineering program.

Activities, Support and Collaboration

File upload

EngineeringProgramReview5c.docx