Program Review - Instructional Program Plan

Program Title Engineering and CIS

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Executive Summary

Please summarize your program's strengths, opportunities/challenges, and action plans. This information will be presented to the Board of Trustees. (1000 word limit)
Click here to enter text.

Program Context

1. Mission: Please identify how your program aligns with the college's mission by selecting the appropriate check box(es):

   ☐Career Technical ☐Basic Skills ✓Transfer ☐Lifelong Learning

   If your program has a mission statement, include it here.
   Cañada College's Engineering and CIS programs are transfer programs that offer the lower-division courses needed by students to transfer to four-year computer science programs or engineering programs in any field of engineering. The mission of the two programs is to educate students from a diverse population to become productive members of the engineering/computer science professions and society at large. Each department combines excellence in teaching theoretical principles and concepts with practical hands-on experience and the development of technical proficiency and communications skills. The departments work closely with the College's Mathematics, Physics, and Chemistry departments, as well as the College's Student Services Division and four-year engineering and computer science programs to maximize students' opportunity for timely completion of courses and successful transfer. Although primarily transfer programs, courses are also available for students who are seeking to update job skills related to engineering and computer science. Engineering and computer science students receive academic support services and professional development opportunities from the College's STEM Center (including the Mathematics, Engineering, and Science Achievement (MESA) Program).

2. Articulation: Describe how your program's articulation may be impacted by changes in curriculum and degree requirements at high schools and 4-year institutions. Describe your efforts to accommodate these changes.
   Changes in high school curriculum have minimal effect on our curriculum. Changes in the curriculum at four-year institutions are reflected in our curriculum. We are in on-going conservations with university faculty in computer science and engineering regarding the lower-division curriculum and requirements for transfer.

3. Community and Labor Needs: Describe how changes in community needs, employment needs, technology, licensing, or accreditation affect your program. CTE programs should identify the dates of their advisory group meetings.
   We are addressing community needs by offering day courses for full-time students and evening courses for working students. We do not have an advisory board.

Looking Back

4. Curricular Changes: List any significant changes that have occurred in your program's curricular offerings, scheduling, or mode of delivery. Explain the rationale for these changes.
   There are no significant changes in the CIS curriculum.
   Changes in the engineering curriculum are in direct response to the recently approved statewide C-IDs. These changes are: increase in the number of units for Engr 270 from 3 to 4, adding Math 251 as a prerequisite for Engr 215, and adding Engr 230 as a prerequisite for Engr 240. Additionally, distance education delivery for the following lab courses have been added: Engr 100, Engr 210, Engr 261, and Engr 270. The Engineering Department recently received a three-year grant for over $700,000 from the National Science Foundation to develop online labs for these courses. There have been no changes in the CIS curriculum this academic year, due to the fact that the CIS curriculum is part of the new Computer Science Degree and it is up to date.

5. Progress Report: Provide your responses to all recommendations received on your last program review and report on progress made on previous action plans and toward your strategic goals.
   Link: 2013-2014 Program Plan and Feedback forms
   There were no recommendations from the the reviewers of the last program review for CIS and Engineering.

6. Impact of resource allocations: Describe the impact to-date that each new resource (staff, non-instructional assignment, equipment, facilities, research, funding) has had on your program and measures of student success.
   Programs developed through grant-funded programs including Math Jam, Physics Jam, tutoring, and Supplemental Instruction have significantly increased enrollment not only in engineering and CIS but in other STEM areas as well. These programs have also led to improved student performance and increased student engagement in academic and professional development activities such as internships, workshops, seminars, conferences, and student clubs.

   In fall 2014, grant funding for four new programs has been successfully secured: $607,678 from the National Science Foundation S-STEM Program to award as scholarships for STEM students; $710,877 from the NSF IUSE Program to develop online labs for lower-division engineering courses; $63,929 from the NSF REE Program for a research project on the impact of prior engineering-related employment on nontraditional students; and $49,999 from NSF to organize a state-wide engineering articulation workshop.

   - We need to continue offering more of the new courses and additional sections for the new Computer Science curriculum to meet the increase in demand.

- Participate in all campus events, like Career Days and Major days and High School feeder events that inform potential students about the new CS degree and certificates
- Promote the Computer Science Club and its associated company tours, speakers, game days and code competitions and create a long term network for CS majors.
- Further and promote an integrated curriculum and set of lectures for all the CS courses
- Hire additional CS professor for the growing program
- Continue working with the Articulation officer to keep articulation agreements current
- Insure the availability of CS tutors to increase student success

Current State of the Program

Data packets link http://www.canadacollege.edu/programreview/datapackets1314.php

7. Connection & Entry:
   A. Observation: Describe trends in program and course enrollments, FTES, LOAD and Fill Rates. Cite quantitative data and specific tables from the data packets.

      Engineering:

      Over the last five years enrollment in engineering has been increasing. Course enrollments decreased from 2012-13 to 2013-14 due to two reasons. First enrollments for the AY 2012-13 include a cohort of veterans who are participating in the grant-funded Bridge to Engineering Program for Veterans. This grant program ended in spring 2013. Additionally, an additional drop in engineering enrollment was brought about by the enforcement of prerequisite requirements starting fall 2013. The drop in the FTES and LOAD from 2012-2013 to 2013-14 is also a result of the deletion of HBA requirements for most of the engineering courses. For instance, even though the headcount increased from 174 in spring 2013 to 184 in 2014, the load actually decreased from 683 in 2013 to 571 in 2014. The fill rates reported are artificially low because the enrollment limits for lecture courses (Engr 230, Engr 240, and Engr 260) are high (up to 70 students) to accommodate the demand among online students.

      CIS:

      Over the last two years since the beginning of the new Computer Science program there has been a steady increase in the number of course offering and the number of students enrolling in the courses. For instance the 2012/13 headcount is 137 and the next year the 2013/14 headcount more than doubled to 296. The end of term fill rate are averaging about 65%. The FTES increased from 20.68 in 2012/13 to 49.40 in 2013/14. The load in 2012/13 was 408 and increased to 463 in 2013/14. The success of the computer science program is expected to further increase in the next academic year, due to a strong program and heavy demand for CS graduates.

   B. Evaluation: What changes could be implemented, including changes to course scheduling (times/days/duration/delivery mode/number of sections), marketing, and articulation that may improve these trends?

Engineering:

For engineering courses, except for Engr 111 – Surveying, all courses are at or near their maximum enrollment capacities. The department is considering increasing the number of sections offered. For instance, this semester two sections of Engr 100 are being offered. Additionally, Engr 260 and Engr 261 are being offered for the first time in summer 2015. The online option for the lecture courses has been able to accommodate the increase in demand. This has been more difficult to do for lab courses. Currently, the Engineering Department is engaged in an NSF-funded project to develop online labs for four courses: Engr 100, Engr 210, Engr 270, and Engr 261. At the end of this three-year grant project, we anticipate being able to accommodate additional demand for lab courses through online offerings. Enrollments in Engr 111 are expected to remain low; the course is required only for Civil Engineering students who are transferring to a CSU. The plan for this course is to offer only every other year.

CIS:

For the Computer Science program, the number of sections being offered is steadily increasing as the program becomes more popular and cohorts of students are passing to the next level of class. Offering more evening courses for the working adult is to be implemented next academic year. Updating the Apple iOS programming class description to add the updated language 'Swift' will also be implement and taught.

8. Progress & Completion:
   A. Observation: Describe trends in student success and retention disaggregated by: ethnicity, gender, age, and enrollment status, day/evening. Cite quantitative data and specific tables from the data packets.
   B.

Engineering:

Except for 2009-2010, the retention rate for engineering courses has stayed above the retention rate goal of 84%, ranging from 85% to 88% retention rate from 2010-2014. The success rate has also been above the success rate goal of 70%, ranging from 80% to 82% for the last four years. There is no observable correlation between retention/success rates and ethnicity or gender. With respect to age, the 18-22 group appears to consistently have retention and success rates compared to the 23-28 group, or the 29-39 group. The sample sizes for the other age groups are too small to make any reliable observation. The success and retention rates for the day students appear to be slightly higher than for the evening students. It should be noted, however, that a direct comparison of day and evening student performance should not be made because the courses offered during the day are different from those offered at night.

CIS:

The Computer Science degree program is a new program. The Trends for Student Retention have increased over the previous CIS Program. Student Success was 45% in 2011/2012 for CIS and increased to 61% in 2012/13 and 61% in 203/14 for CS. Student Retention rates have also

increased from 64% in 20111/12 for CIS to 79% in 2012/13 and 77% 2013/14 for CS. There is no observable correlation between retention/success rates and ethnicity or gender. With respect to age, there is no statistical significant between age groups, due to in some cases sample size. It should be noted, with the new CS degree program, the overall improvements in the success and retention rates is attributed to the successful implementation of an improved curriculum which utilizing WebAccess for all classes. This allows students from both on-campus and online sections to have quality access to instruction 24/7 online. Partnering with the STEM Center, also has increased the number and availability of CS Tutors, which also has positively increased the retention and success rates. The hiring of a full time faculty is the driving force behind these improvements.

C. Observation: For online courses describe any significant differences in the success and retention of students who are taking online courses compared to face-to-face courses.

Engineering:

The success and retention rates for online courses appear to be lower than the face-to-face courses. It should be noted, however, that courses that are available online are not the same courses as those that are available only in face-to-face format. The three courses that were offered online in the last five years (Engr 230, Engr 240, and Engr 260) are the three most difficult and advanced courses offered by the Engineering Department. These are lecture courses that do not have lab components. Purely lab courses such as Engr 261 and courses with labs (Engr 100, Engr 111, Engr 215, and Engr 270) can be positively affected by the lab component of the courses since labs generally are easier and can raise students' grades in a course.

Another possible contributing factor to lower student retention and success rates in online courses is the prerequisite courses. For Engr 260, for instance, the course math and physics prerequisites are not being enforced (because Cañada and CSM's Engr 260 courses are not completely compatible), students frequently register for the class without the prerequisite. Ensuring that students have the right prerequisites (or at least have the math skills needed to be successful in the class) is much easier to do in the face-to-face course and in the online course. Additionally, face-to-face courses are generally "regular" Cañada students that are more familiar with the course offerings and what is needed to be successful in those courses.

It should also be noted that even though the success and retention rates for online courses are lower than face-to-face courses, these rates are close to the target rates. For instance, for 201314, the retention and success rates for online courses are 79% (slightly below the goal of 84%) and 72% (slightly above the goal of 70%).

CIS:

The success of the Computer Science online program has also increased. The number of online students has increased due to more online sections being offered in the summer session. The number of online students has change from 31 in 2012/13 to 119 in 2013/14. The success rates of the online course are lower than face-to-face courses. The rates are close to the target rates.

The success rates of the full semester online class is higher than the short term 6 week summer class. This is as expected.

D. Evaluation: Based on these trends, what do you feel are significant factors or barriers influencing student success in your courses and program? What changes (e.g. in curriculum, pedagogy, scheduling, modality) could be implemented to improve these trends?
The retention rates of students in engineering courses have been slightly higher than the target rates but there are measures that can be done to further improve them. Increasing the course offerings and the number of sections can help reduce the class size (which in some lecture courses are over 60 students) so that students receive the individual attention they need to succeed. Furthermore, enforcing prerequisites for Engr 260 could also improve student performance in this class. Recent changes in the course prerequisites for Engr 230, Engr 240, and Engr 260 will also contribute to better student preparation and improved performance in these courses.

The Retentions rates for students in Computer Science courses has been good. However, they can be improved. The way to increase the success rate is to insure that the student is taking the courses in the correct sequence. This is achieved by discussing with each student the proper course sequence during the first day of class. Furthermore, the success rates are increased when the students are encouraged to use all the resource available to the them, such as the STEM Center tutors.

9. SLO Assessment:
https://smccd.sharepoint.com/sites/can/CANSLOAC/default.aspx

A. Are all course SLOs being systematically assessed at least once/4 years? Describe the coordination of SLO assessment across sections and over time.
Course-level student learning outcomes and department-level learning outcomes for engineering courses have been assessed regularly. Most of the course-level SLO assessment results have been satisfactory. A total of 186 individual course SLO assessment results have been reported in Tracdat, and less than 5% of these results did not meet the criterion. Course level SLO assessments that have yielded unsatisfactory results have been used to make changes in specific courses (length, depth and order of coverage of topics; methods of delivering content and assessing student learning, etc.)

For CIS, a comprehensive review and revision of SLOs was done in 2013 due to new courses that were developed and added to the program.

B. Summarize the dialogue that has resulted from these assessments. What are some improvements in your courses that have been implemented through SLO assessment? How has student learning been improved by changes in teaching? Cite specific examples.
For engineering courses, results of SLO assessments in minor changes in the courses including changes in the order in which topics are covered, amount of time spent on specific topics, and additional formative assessments (e.g., quizzes) on topics that proved difficult for students. For CIS, we have implemented additional modalities of delivering content (e.g., videos).

10. PLO Assessment:
PLO Assessment link https://smccd.sharepoint.com/sites/can/prie/_layouts/15/start.aspx#/

A. Describe your program's Program Learning Outcomes assessment plans and results of direct and indirect assessments.
Results for Program Student Learning Outcomes assessment results have been collected and uploaded to Tracdat for all five of the PLOs using data for engineering students who transferred or received an AS degree at the end of spring 2012, spring 2013, and spring 2014. All these assessment results are satisfactory, with all the success criteria met. Effective spring 2014, the number of PLOs have been reduced from 6 to 5. It was decided that PLO #6 "Formulate a plan of study to obtain a Bachelor's degree in engineering or computer science" is covered only in the introductory courses, and many students do not take these courses since they are not required by all of the four-year programs. The CS program level outcomes have been reviewed are currently good. All the assement results are satisfactory, with all success criteria met.

B. Summarize the major findings of your program's PLO assessments. What are some improvements that have been, or can be, implemented as a result of PLO assessment?
Since the assessment results of PLOs have been satisfactory, no major improvements have resulted from these assessments. The Engineering Department is planning to use e-Portfolios for direct assessment of Program Learning Outcomes. The e-Portfolios will be piloted in Engr 100 – Introduction to Engineering this semester. The Computer Science department is using subjective WebAccess Surveys, and will be using ObjectiveWebAccess 'Outcomes' to tie each specific PLO to assignments. The results will be written in a Excel spreadsheet and uploaded to TracDat.

Looking Ahead

11. Strategic goal & action plans:

How will you address the opportunities for improvement that you identified above in Articulation, Community & Labor Needs, Connection & Entry, Progress & Completion and PLO Assessment? Identify timelines for implementation, responsible party, and resource requirements.

Action Plan	Timeline	Responsible party	Resources required
Hire a new tenure-track Engineering/CIS full-time faculty to assist in increasing the number of courses offered and improving the curriculum.	Spring 2015	Dean Janet Stringer and Amelito Enriquez	This new position is being funded by the College.
Continue four-year university regarding curriculum. For	October and March of each year.	Enriquez, Langhoff	Professional development funds to attend the ELC.

engineering this will be through the Engineering Liaison Council.			
Actively promote academic and student support services among engineering and CIS students; work with STEM Center staff, including the MESA Director	On-going throughout the semester.	All Engineering and CIS instructors	None
Pilot e-Portfolio in engineering courses in introductory courses.	spring 2015 for Engr 100; fall 2015 for Engr 210	Langhoff, Derafshi Enriquez	Assistance from Learning Center
Develop and implement online curriculum for engineering lab courses Engr 100, Engr 210, Engr 261, and Engr 270.	spring 2015 to spring 2017	Langhoff, Enriquez	Resources needed are available through a three-year NSF IUSE grant.
Continue to pursue external funds to develop new programs and expand successful existing programs.	on-going	Enriquez	none

Complete the Resource Request form to request instructional equipment, IT equipment, facilities, professional development, research, or funding (if needed) and submit with this form to your Division Dean.
Link to resource request form http://www.canadacollege.edu/programreview/instruction-forms.php