COMPREHENSIVE PROGRAM REVIEW REPORT

Engineering

Program Context

1. Mission

Share how your program contributes to the College or fits into the College's Mission. For example, what other academic programs and student/academic services does your program engage with? Examples of student/academic services include the Learning Center, Library, STEM Center, SparkPoint, Dream Center, etc. Another example, how does your program fit into any of the College's plans (such as Equity, Technology, Strategic Enrollment, etc.)? If your program has a mission statement, you may include it here.

Cañada College's Engineering program is a transfer program that offers the lower-division courses needed by students to transfer to four-year programs in any field of engineering. The mission of the program is to educate students from a diverse population to become productive members of the engineering professions and society at large. The 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, Computer Science, and Chemistry departments, as well as the College's Student Services Division and four-year engineering 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. Engineering 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

Are there changes in curriculum or degree requirements at high schools or 4-year institutions that may impact your program? If so, describe the changes and your efforts to accommodate them. If no changes have occurred, please write "no known changes."

No known changes

3. Community & Labor Needs

Looking Back

4. Curricular changes
5A. Progress Report - IPC Feedback
5B. Progress Report - Prior Program Goals
6A. Impact of Resource Applications
6B. Impact of Staffing Changes

Current State of the Program

7A. Enrollment Trends
7B. Significant Changes in Your Program
7C. Planning for Your Program
8A. Access & Completion
8B. Student Equity
8C. Completion – Success Online
9A. SLO Assessment - Compliance
9B. SLO Assessment - Impact
10 PLO Assessment

Looking Ahead

Next Step: If your program is requesting resources, please go to "STEP 2: Resource Request (OPTIONAL)" and submit your specific requests there. Otherwise, this is the last prompt in the comprehensive program review form.

Supporting Information

2024 - 2025

Program Context

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Achievement (MESA) Program). The program is also successfully engaged with the Dual-enrollment program of the SHSD.

2. Articulation

Are there changes in curriculum or degree requirements at high schools or 4-year institutions that may impact your program? If so, describe the changes and your efforts to accommodate them. If no changes have occurred, please write "no known changes."

No known changes in this cycle.

3. Community & Labor Needs

Are there changes in community needs, employment needs, technology, licensing, or accreditation that may affect your program? If so, describe these changes and your efforts to accommodate them. If no changes have occurred, please write "no known changes". CTE programs: identify the dates of your most recent advisory group meeting and describe your advisory group's recommendations for your program.

Engineering as a field continues to be in very strong demand, both in the local and regional areas surrounding the district, as well as state wide, and nationally.

For example, lightcast labor data shows that our regional area (comprising of the counties of San Mateo, San Francisco, Santa Clara, Santa Cruz, Alameda and Contra Costa) is a hotspot for engineering job postings, with ~74K postings as compared to the national average of ~42K. Likewise compensation for engineerings jobs in our region has a median of ~$156k versus $105K as the national median. All in all, the field is extremely healthy and employment in engineering is predicted to continue to grow through 2033 and beyond.

The healthy state of the engineering profession is also partly reflected in the engineering programs student enrollment and headcount. The headcount has more than doubled from 2019-2020 AY, going from 97 to 206 in the 2023-24 AY, while enrollment has increased from 142 to 238 during this same period.

However, this enrollment success would not be possible without the continued support provided by Dean and College Administration through the understanding of this discipline and its needs. Engineering classes often requires students to have successfully passed several stages of math, physics and chemistry prior to being eligible for many of the engineering offerings. This naturally leads to lower class enrollments for advanced classes and the support of the Administration in allowing smaller class sizes to run is a critical part of success in our enrollment as well as eventual transfer.

One pending challenge that the program is facing relates to the availability of adjunct faculty. The program had been very fortunate to have a long standing adjunct who taught across the district and also taught the very popular Dual-enrolled ENGR 100 class on the Woodside Highschool campus. However, since Summer of 2024, this instructor has moved to a permanent instructor position in another district and there is an urgent need to find adequate replacements for this adjunct instructor.

Currently, students in the program utlize classroom laptops for in-class lesson and laboratory work. ITS has informed us in 2022 that these older gen lenovo laptops will no longer be supported. However, the program has managed to continue to use these laptops with success through the various ENGR classes. Nevertheless, ITS has strongly recommended replacing this with newer laptops. A resource request will be filled for obtaining the newer machines.

The engineering program does not require licensing and accreditation.

The board of advisors (BOA) for the CTE program, photonics and laser technology (PALT), met for an annual meeting in August (08/2024). While Bay area laser and optics companies continue to have need for well trained technicians in areas of optics, lasers and photonics, the enrollments for the first offerings of classes through the PALT certificate programs were low and through discussions with the Dean, the program offering was put on hold to find ways to address the issue. The BOA recommendations included marketing the PALT program to working adults, tailoring the classes to

be convenient for working adults, and to offer shorter certificates, i.e. those that could be completed in a single semester. In order to indertake this new marketing approach, personnel resources will be required.

Looking Back

4. Curricular changes

List any significant changes that have occurred over the prior years in your program's curricular offerings, scheduling, or mode of delivery. For decisions made by your department, explain the rationale for these changes. If applicable, how have state policy changes affected your curricular offerings?

The major curricular change is related to the upcoming removal of the ENGR 111 class from the list of offerings. This Engineering Surveying class is a highly specialized class generally taught to students in the Civil Engineering Major. Over the last 5 years, this class has not been offered due to the low demand for it. Therefore, the department has planned to remove this class from the potential list of classes offered.

The introduction to engineering class (ENGR 100) is an excellent way for high school and entering college students with STEM and Non-STEM backgrounds to explore the field of engineering. We have continued to have success with teaching this class on the Woodside high school campus as a Dual-enrolled class. While the plan is to continue this, our long-time adjunct has moved to a permanent teaching position and a replacement willing to take on this Dual-enrolled class will need to be found.

All the offered ENGR classes, incuding ones with lab component, are now being offered as Hybdrid classes, i.e. with both asynchronous remote content and in-person meeting times. This includes ENGR 100, 210,215, 230, 260 and 270. ENGR 261 is a lab only class and therefore only offered as an in-person class.

The number of Zero Textbook Cost (ZTC), Open educational resources (OER) or low textbook cost (LTC) designated classes have increased significantly since AY2021. ENGR 215 has traditionally used the paid licensed software MATLAB and is now taught using the free open source resource called OCTAVE, which utilizes the same programming language as MATLAB. ENRG 260 and ENGR 261 are now offered as ZTC classes. The ENGR 100 class is now offered as a LTC designated class as the textbook costs leass than $40.

Some specialized ENGR classes have seen a chronically small enrollment. In particular, these are engineering dynamics (ENGR 240) and surveying (ENGR 111). Therefore, these classes are not being offered on a regular basis. CSM has decided to add ENRG 240 as an offering on their campus starting in AY 2021 but enrollments there remain in the 3-5 student range. As noted above, we have already planned to remove future offering of ENGR 111.

5A. Progress Report - IPC Feedback

Provide your responses to all recommendations received in your last program review cycle.

IPC Feedback #1: Sec 8a Access & Completion

IPC Recommendation:

- Mention that implementation of OER is across multiple sections and courses

Response: All engineering classes appearing in webschedule that fall under OER, ZTC or LTC category are now consistently listed with these desginatiors across all sections.

IPC Feedback #2: Sec 10. PLO Assessment

Recommendation 1: Description of Program/Department's 3-year assessment plan

Response:

- The program has 6 (six) PLOs identified for the current 3 year assessments. The PLOs cover thr high level objectives applicable to engineering students, including communication, skills, knowledge, experimentation, planning and design.
- The PLOs collectively map to all the listed ILOs for the program

Recommendation 2: Summary of Major findings

Response

- All 6 PLOs were assessed for this cycle using four (4) different engineering classes. Four of the PLOs were assessed using classes taught between Fall 23 – Spring 24, while two of the PLOs were assessed using classes taught in Fall 2019.
- Typical criterion for assessing success in each PLO included at least 80% of students achieving the described PLO goals. Based on this, all 6 of the PLOs successfully met their criterion.

Recommendation 3: Improvements that have been and/or can be implemented

Response:

- The existing description for each PLO also had references to CIS classes. These references have been removed since the Engineering program is distinct from the computer science program.
- Two of the PLOs used classes taught in 2019. In the next evaluation, these PLOs will be assessed using classes taught within the past year of the assessment period.
- Currently, the "Plan of Study" PLO is being assessed based on students successfully completing either the Oral OR written portion of a final project, This assessment criterion for this PLO will be modified to require all students to successfully complete BOTH parts of a final project, i.e. the oral and written components.

5B. Progress Report - Prior Program Goals

Provide a summary of the progress you have made on the program goals identified in your last program review.

1. Increase pool of adjunct instructors

Response: In the initial part of this review cycle (2022-23) three new adjunct faculty (were hired to support teaching of various engineering and PALT classes. These faculty taught ENGR 100, and several classes within the PALT program. However, over the course of this reporting period, we have lost one long-standing adjunct (Sumi Sukumar) as she has moved to a permanent instructor position in another distict while the other engineering adjunct is unable to commit to teaching on a regular basis. So the need for adjuncts continues to be of immediate and urgent need.

2. Continue to expand online course offerings

Response: This objective was successfully achieved as most ENGR classes are now available in with hybrid modality, i.e. asynchronous remote content with in-person meeting times. The Lab only class (such as ENGR 261) is offered only as an in-person class due to restrictions on use of lab equipment in remote or home settings.

3. Develop a three-year SLO assessment plan.

Response: SLO's for five (5) out of the seven (7) active ENGR classes have been updated. The remaining two classes (ENGR 210 and ENGR 215) will be updated in Fall of 2025 with inputs from the adjunct faculty who have taught them. There are two inactive classes: ENGR 111 and 240. SLOs for ENGR 111 will not be addressed as this class is being phased out, while no update is currently planned for ENGR 240 as this class has not been offered since AY2022.

4. To update laboratory resources for engineering classes

Response: This update process has been partially completed with specific details as below
1. ENGR 270 was updated with resource requests that resulted in purchase of various PASCO instruments.
2. ENGR 261: This class will be upated with new instrumentation through a resource request placed for the 2024-25 cycle.
3. ENGR 100: Upgrades were made to existing robotics kits (Lego Mindstorm) through department funds. Further upgrades are planned and will be part of resource request for next cycle.
4. Engineering laboratory and classroom computers: The current lenovo laptop computers are no longer supported by IT services. The program has significantly prolonged the life and usage of these computers with instructors efforts to successfully utilize open source or laboratory equipment manufacturers suppled software (like PASCO, TecQuipment, Allied Instruments). However, given IT services inability to continue to maintain these computers, resource request will be filled to upgrade to new computers.
5. The PALT program has considerable lab equipment that is currently housed in rm 16-108. It is difficult to use this room for other classes due to the lab equipment requiring use of the student countertop space. As such, this room continues to be earmarked for the PALT classes.

5. To build laboratory facilities for engineering classes as well as ancillary programs related to engineering such as the engineering club

Response: Clasroom 16-106 continues to serve as the key engineering lecture + lab classroom. The classes taught here include ENGR 100, ENG 260 and 261 and ENGR 270. All of these classes are eother lecture+lab or fully lab classes. Over the last year, instructor removed older and/or defunt lab components and equipment freeing upo space for the new lab equipment purchased. The expectation was that there will also be sufficient space to house the Engineering Club Robotics equipment.

However, the computer classroom 16-110 is no longer available as buffer or overflow space for engineering lab items as this space is now owned by IT Services. Instead, the computer classroom is now using classroom in ther new Sci and Tech Building. Nevertheless, this does create ongoing issues with storage of engineering club items. The club is continuing to use space in the STEM center, but, as the club grows from year to year, this will remain an ongoing issue.

In summary, while space to house the engineering class laboratory equipment is currently availble in room 16-106, older items will need to be removed to add better flexibility to the classroom space. Instructor will work with Dean to remove some of these items.

6A. Impact of Resource Applications

Describe the impact to date of previously requested new resources (assignment, equipment, facilities, research, funding) including both resource requests that were approved and not approved. What impact have these resources had on your program and measures of student success? What have you been unable to accomplish due to resource requests that were not approved?

In the last cycle the following resource requests were made: Facilities requests, including, fume hood and eye wash station - In order to provide safe usable laboratory space to perform engineering experiments

However, due to COVID, significant changes to planning were made and the resource requests related to fume hood access and eye was station were not completed. Therefore, the “Impact of Resource Application” is not possible to assess in this cycle.

6B. Impact of Staffing Changes

Describe the impact on your program of any changes within the last program review cycle in staffing levels (for example, the addition, loss or reassignment of faculty/staff). If no changes have occurred please write "not applicable."

The engineering instructor position was in great flux prior to 2019. However, since fall 2019, the position has been staffed and the program appears to be in a stable state, with indications of growth over the past four years.

Staff stability has lead to increased offering of engineering classes, including in modality. For example, it has been possible to offer a dual-enrolled ENGR 100 class at Woodside High School, that has been taught by a long time adjunct in the district.

However, we are again facing challenges with adjunct faculty staffing that effects our ability to offer the Dual-enrolled class as well as routine class offerings, such as ENGR 210 and ENGR 215. Hiring more adjuncts will be of urgent ongoing need.

Current State of the Program

7A. Enrollment Trends

Use the data provided by PRIE to examine your enrollments by department or courses. Describe trends in headcount, FTES, and load. If applicable, describe any other enrollment data that is relevant to your program.

Overall, current state of the program as seen in enrollments, section counts, FTES and LOAD, look healthy in relation to college-wide metrics.

For the 4-year period from 2019-2020 through 2023-2024, college wide enrollments had a relatively small change (from 28,465 to 27,506) while headcounts were about the same (10,314 to 10,969). Although there was a large fluctuation during the Covid period, college wide enrollments are steadily increasing since 2021-22. During this same period, Engineering enrollments went from 142 to 238, an increase of about 68%, while the headcount more than doubled from 97 to 206 (a nearly 112% increase).

While engineering enrollments also mirrored the Covid dip of the oveall enrollments, the overall higher rate of increase in engineering is likely due to three factors.

- One is that the engineering job sector remains very healthy both in the local region as well as nationally.
- Second is the tremendous support of the Dean and administration in permitting smaller class sizes to continue to be offered and this is seen as a very important factor as it sets of a chain reaction that students respond to. A hypothesis is that not offering an advanced engineering class leads to students taking classes in other colleges or even choosing not to take more engineering classes at all. This idea will be explored with PRIE data in upcoming cycles.
- Third, the last 4 years have been stable from availability of a full time instructor making it possible to regularly offer all the popular engineering classes.

The section count rates have been relatively steady at 11 over the past few academic cycles, after being at 10 in the 2019-20 AY.

The FTES value in 2019-20 was 23 and it has steadily increased since then, more than doubling to its current value of 49 (2023-24). The FTEF value in 2019-20 was 2 and is currently at 3, after reaching 4 in 2022-23.

The LOAD for the program was at 218 in 2019-20 and since then, has increased steadily to 421.

7B. Significant Changes in Your Program

Have there been any significant changes in enrollment trends or course offerings? For example, has there been a significant increase or drop in FTES or Load? If applicable, consider trends in class cancellation rates and how it might have affected your course offerings. If needed, consider how the pattern of course offerings (times/days/duration/delivery mode/number of sections) affected your enrollment?

The program as a whole appears to be on a healthy trend as measured by various metrics, and no large change was evident. While the load has nearly doubled, increasing from 218 to 421 from the 2019-20 period through 2023-24, this load is in line with the college-wide average loads between 405-440 over this period.

Between 2019 through Fall of 2024, 9 different engineering courses have been offered, including currently inactive ENGR 111. Over this period, while ENGR 111 has had a 100% cancellation rate, all the other classes have had a 0% cancellation rate. In terms of total sections offered and cancelled, 61 sections have been offered with 2 cancellations for an overall averaged cancellation rate of 3.3%. This cancellation rate is lower then the institution set/target rate of 9% (and substantially lower than college-wide average of 14.7 % between 2019-2023). This suggests yearly section offerings of engineering classes are in line with student needs.

7C. Planning for Your Program

What changes could be implemented, including changes to course scheduling (times/days/duration/delivery mode/number of sections), curriculum, marketing, and articulation of pathways that might improve these trends? If applicable, include plans for faculty recruitment and faculty training. NOTE: If other sources of data are used, please upload these documents or provide URLs.

1. Currently ENGR enrollments and headcounts are on a positive slope year to year. One way to continue this increase is to maintain and/or increase frequency of offering of the on-line only sections of certain ENGR classes. Currently, classes are offered largely keeping in mind the potential "sequence" of classes a transfer student in engineering is likely to take over their time in the college district. However, the program is seeing an increasing number of on-line only students from 4-year colleges who need to take engineering classes to fulfill their Bachelor's degree requirements. Over the last two semesters (Spring 2023 and Fall 2024) ENGR 230 and ENGR 260 saw students from outside the SMCCD system (i.e. students who are not in our 2-year programs) who took the online version. While more data needs to be gathered on whether this is a reliable increase, it appears to be beneficial to the program to continue to offer the on-line only version every semester. In other words, classes like ENGR 210, 230 and 260 could be offered as an online option every semester while additionally offering the in-person options every other semester (that largely aligns with our 2-year students needs). This model could impact enrollment while also allow our students to be able to access in-person cohorts through their junior college period.

2. The introduction to engineering class, ENGR 100, is seen as an exploration of engineering as a potential major field to those students who are not yet commited, while also being a transfer class for those who are commited to engineering. So offering this class with highest possible frequency is seen as a critical part of programs success. Currently, we offer a dual-enrolled class at Woodside

High School, offer the class in the fall and spring semesters and occasionally offer it in the summers. Students, especially those in high schools, routinely inquire about the summer offering of ENGR 100. It would be very helpful to commit to offering summer sections of ENGR 100 every year. Historically, summer sessions have been offered by a long term adjunct, who has now left the district.

3. Increase offerings of dual-enrolled engineering classes. Currently, we offer ENGR 100 as a dual-enrolled class, but there is also significant interest in expanding to offering ENGR 210, the engineering graphics class as well. However, both these dual-enrolled course offerings will require hiring of adjunct faculty.

4. The STEM center plays a critical part in fostering engineering student success through support via tutors and ability to interact with other students in the cohort. Over the last few years, instructor has observed a (qualitative at this time) drop in the time spent by students there. It is not clear if this has been observed by other programs as well but seems to have correlated with the brief loss of MESA program, which is now back and running.

5. Dynamic and/or real-time Marketing of program, such as through oublications of student activities via social media sites, could be of some positive value towards growing the program and its associated certificate offerings. If college could help streamline a pathway for the instructor to be able ot efficiently upload such information through relevant social media accounts, that could have a positive impact to enrollment and retention.

6. Several ENGR classes are taught in Rm 16-106, a room that serves as a laboratory space along with a traditional lecture-style classroom . This older classroom faces the usual challenges related to access to power for student and lab laptops (floor access was recently improved by facilities), and has a very old projection system. Relevant discussions have have taken place with ITS and adminsitration to improve the capabilities in the near future.

8A. Access & Completion

Describe the student completion and success rate in your courses and/or program using the data provided by PRIE. Look at your course offerings, in the last program review cycle was it possible for a student to complete your certificates or degrees while only completing courses at Cañada College? How can the college help you improve student completion and success? What changes could be made?

Overall, current state of the program as seen by satudent completion and success rates as well as retention across various modalities, look healthy in relation to college-wide metrics.
College-wide course success has generally been between 71 to 73% over the 4-year period of this analysis. In contrast, success rates for the engineering program courses have been consistently higher than the college average. In 2019-2020 the success rate reached an all time high of 94% (in contrast to the college value of 71%). However, the pandemic year saw a significant drop in success rate to 76% (although still higher that the college wide value of 73%). and currently the success rate is at 78.2%, still higher than the overall college value of ~73%.
One of the key changes over this time period has been access to various course modalities such as face-to-face, online, hybrid and synchronous. With at least two years worth of data, it is worth considering the success rates for these different modalities. In general, for engineering, the modality that maximized real-time in-person contact with students appeared to have higher success rate than the other modalities. For example, in 2023-24, face-to-face success rate was ~89%, while hybrid was 76%, online was 74% and synchronous was ~70% . This general trend was also evident for the 2022-23 AY. This is a significant finding as it re-emphasizes a well-known tenet in engineering study as

well as the engineering workplace in that collaborative discourse between students is a critical part of success in this field.
In contrast to engineering, the college wide success rates in these different modalities are quite similar to each other. For example, in 2022-23, face-to-face was ~74%, hybrid was ~73%, online was ~73% and synchronous was ~70%.
College-wide course retention rates averaged 85% over the past 4 years. College wide averages did not show a huge difference in retention based on course modality. In contrast the course retention in engineering courses averaged 90% in the face-to-face and synchronous modalities. But for the hybrid and online scenarios, the retention rates were significantly lower at 78 and 81% (in 2022-23), and is very likely related to the earlier comment that collaborative discourse between students, which does NOT happen much in these modalities, contribites somewhat to the lower retention in these modalities.

Course retention by self-identified genders (and with count above 10) did not show a significant difference between Female and Male from year to year, with averages being around 88% for Female and 85% for Male. While Year to Year Course retention by race did not have a particular trend, there were some consistent findings. For example, highest success rates from year to year were either amongs Asians or Filipino's. Multiracial white-non-hispanics generally had high success rates (83% or above) from year to year. It was not possible to extract Black/AA retention rates due to the small number of students.
Given the HSI designation of our institution, it is useful to compare the success rates for Hispanic identified students program wide as well as in relation to the college's overall numbers. In engineering, the program-wide average over the period 2019-20 through 2023-24 was 82.3%. However, Hispanic students in engineering did show lowest success rates amongst the various races in 2 of the 5 reporting periods studied. In contrast, the college wide success rates for Hispanic Students was 83.2% suggesting that engineering was comparable to college wide results.
Looking at success rates in the specific classes offered by the program between 2019-20 through 2023-24, highlight some very useful trends. Averaged success rates are 77% or higher across all the classes except for ENGR 215, which is the computational engineering class. This appears to be a consistent issue dating back before the 2019-20 year. We had earlier hypothesized that access and equity issues due to use of proprietary paid licensing software (MATLAB) could be a contributing factor. However, starting in Spring of 2022, this class was taught using a free open source software called Octave along with OER education resources making is a zero textbook class. During this period, the success rate has been quite low, averaging 70% with a low of 47% for the Sp23 semester. Along with the lower success rate, this course has also had a higher than average withdrawal rate. Some potential reasons for this could be that this course has had changing adjunct instructors teach it. Having a more long-term instructor familiar with the open source software and OER text could likely address this issue. Another possibility is the unique nature of this class. This is the only class in ENGR that requires learning a new computational programming language and applyign it to complex engineering problems. Most students enter this class with no prior programming experience since that is not a prerequisite.

8B. Student Equity

One of the goals of the College's Student Equity plan is to close the performance gaps for disproportionately impacted students. Use the data provided by PRIE that indicates which groups are experiencing a disproportionate impact in your program. Which gaps are most important for improving outcomes in your program? How can the college help you address these gaps? What changes could be made?

Nationwide, engineering as an educational and professional field continues to suffer from a significant gender gap. This behavior continues to also be evident in the engineering program at Cañada.

Program Review

The number of students self-identifying as female persists at being a small fraction of the enrolled students in engineering at ~17%. While this number has been largely unchanged since 2016, there has been a peak in 2022-23 to 21%. This could correlate with offering of the dual-enrolled class at Woodside high, that was also taught by a Female instructor, along with also offering an ENGR 100 class taught by a second female adjunct instructor. However, this success has not been repeated and it suggests a more systemic problem that begins early in schooling and continues into high school and beyond. Working to increase female students in STEM disciplines, especially math and physics, early in school, could be the most likely success route to increasing this number.

Research has suggested that when students interact with successful professionals who have similar gender, race and ethnic backgrounds, there is an increased likelihood of motivation to pursue similar careers. Instructor is PI on NSF TRABAJO grant through which students in STEM disciplines are provided opportunities for career exploration activities, such as Job Shadows, Mentoring, Internships and Site Visits. Efforts are being made to have STEM students from under represented groups to participate in this. For example, job shadow provided by Talas, a biomedical engineering company, included three female engineers. The first quantitative data on such efforst, disaggregated by different student qualifiers will become available late in the Fall of 2024 following the hiring of a data analyst and consultant on the grant and could be illustrative of potential strategies to encourage a diverse group of students to pursue STEM careers as well as enhancing their retention in STEM.

Over the 5-year period of this reporting, the engineering program had a higher average enrollment percentage of Hispanic students (64.8%) as compared to the college average of 54.5% over the same period. Given that HSI classification of the institute, it is illustrative to look at PRIE Course Outcomes Data by Demographic Variables to assess the engineering program's ability to provide successful outcomes for HSI students. For the period of 2019-20 through 2023-24, the program's success rate for Hispanic students ranged between ~67-86% for an average of ~78%. In contrast the college-wide success rates for this group was significantly lower, ranging between 65-67% for an average nearer to 66.4% over the same time period.

Since the department also serves students who have financially challenges, different efforts are being made to help these students succeed in their educational goals.In efforts to further improve equity as well as access to engineering education, the program continues to imoplement, ZTC and LTC classes that could help retain students who face severe financial challenges in their education pathway. However with the free-college program, the district is providing additional resources to help students.

8C. Completion – Success Online

The college has a goal of improving success in online courses. Using the data provided by PRIE, what significant gaps do you see in success between online/hybrid and non-online courses? What changes could be made to reduce these gaps? If your program does not offer online/hybrid courses, please write "not applicable".

College-wide success rates for online courses averaged ~72% and ranged between 70.1 through 73.9%, a remarkably consistent rate through this 5-year period.

In contrast, ENGR online success rates showed a higher degree of success but also a higher degree of variance. From the PRIE data available since the 2020-21 term, success rates ranged between 74.1% to 100%, with an average of ~85%. However, since peaking at 100% success in the 2021-22 AY, the success rate has shown a declining trend and tending towards the college mean.

Program Review

As highlighted earlier, engineering shows a significant gap between success rates in face-to-face modality classes versus those that are online and/or synchronous. For example, in 2023-24, face-to-face success rate was ~89%, while hybrid was 76%, online was 74% and synchronous was ~70% . This general trend was also evident for the 2022-23 AY. This is a significant finding as it supports the idea that collaborative work in engineering study as well as the engineering workplace is a critical part of success in this field.

There are a few ways we could try and tackle this gap.
One is to highlight and emphasize modality success data to students at the time of enrollment.
Second is to incorporate class interaction and collaboration activities through a potential grading scheme that stresses on real-time student interactions (rather than discussions or other message-based interactions that occur at user convenience).

9A. SLO Assessment - Compliance

Are all active courses being systematically assessed over a three-year cycle? Refer to the Program's /Department's Three-Year Assessment Plan and describe how the plan is completed across sections and over time.

Five of the seven active courses have assessment methods and results entered into TracDat. The remaining two courses (ENGR 210 and 215), which have largely been taught by adjuncts, will be assessed by the next annual cycle.
There is currently no plan to assess ENGR 111 since it is planned to be removed frim the catalog of offerings.
Similarly, there is no plan to assess ENGR 240 as it is not being offered currently.

9B. SLO Assessment - Impact

Summarize the dialogue that has resulted from these course SLO assessments. What specific strategies have you implemented, or plan to implement, based upon the results of your SLO assessment?

Since the previous cycle, the following strategeis have been implemented in courses taught (by full-time instructor).
1. Better alignment of the SLOs with various course content, such as lesson, quizzes, assignments, laboratories, exams and reports, were implemented in within canvas LMS for 5 out of the 7 engineering classes offered between 2022-2024.
2. Increased the number of assessed SLO's in each engineering class, either by adding new SLOs consistent with the COR and/or by activating previously inactive SLOS.
3. Updated the criterion for SLO success based on the advanced nature of the class. For example, ENG 100 is an introductory class with minimal physics requirements, while ENGR 260 requires mugh higher levels of math and physics pre-requisites.This was reflected in the "criterion for success" in various SLOS by also increasing the overall expectations for success as students move to higher level classes.
4. With the updates and modifications carried out to the SLOS though this report, five (5) classes (100, 230, 260, 261 and 270) are now in the "No changed needed in SLO or evaluation methids" for the near future.
5. SLOS in Two (2) of the avctive classes, (ENGR 210 and 215) will be updated in the next annual evaluation cycle.
6. SLOS in the inactive ENGR 111 (planned to be removed from catalog) and ENGR 240 (last offering in 2021) will not be updated/evaluated unless the class is offered again.

10 PLO Assessment

Describe your program's Program Learning Outcomes assessment plan using your Program/Department's Three Year Assessment Plan Summarize the major findings of your PLO assessments. What are some improvements that have been, or can be, implemented as a result of PLO assessment?

Six Program Learning Outcomes are identified for the program on the department website. In the last cycle, 5 of the 6 were active and the plan was to assess all 6 PLOS for this cycle. Below is a summary of the activities and major findings.
1. As of this cycle, all 6 PLOS have been assessed.

2. Of the 6 PLOs, four (4) of them were based on the higher level classes (ENGR 230, 260, 261 and 270), while two (2) of them were based on the introductory class, ENGR 100.
3. All six (6) PLO assessment methods were updated to remove references to CS classes and retain references to ENGR classes only as the engineering program is distinct from CS.
5. The "Plan of study" PLO had not been assessed in previous cycle. It is now assessed.
6. All six PLOS were successful as the "criterion was met" for all of them.
7. As of this cycle all six PLOS are assessed to collectively MAP to the five (5) listed ILOS
8. A planned improvement for the next cycle is with regards to the "Plan of Study" PLO. Currently, the criterion for success states that "All students must successfully complete either the oral presentation or written report on the project". However, future criterion for this PLO will be updated to require ALL students to successfully complete BOTH parts of the Plan of Study activitty, i.e. the oral and written components.

Looking Ahead

11. Planning for the future is an important part of Program Review. This is your opportunity to identify new directions for growth and improve your program. Based on your analysis of the data and your responses to the questions above, identify specific and measurable goals and action plans for achieving those goals. Consider goals such as, but not limited to: updating curriculum, closing equity gaps, responding to student and community needs, etc. Please enter your response in the textbox below

1. **Stabilizing offerings of dual-enrolled and regular engineering classes with a "Strategic" Adjunct Faculty hire**: One of the critical needs of the program is the availability of "stable" adjunct faculty who is/are able to teach dual-enrolled classes as well as ENGR 210 and ENGR 215. The college had been fortunate to have a long-standing adjunct who routinely taught the dual-enrolled class as well as ENGR 210 (her expertise). We also had another adjunct who was able to teach math as well as engineering classes (ENGR 215). We need to continue to search for and find suitable adjuncts so that the programs offerings are consistent with the needs of our students while also helping maintain or improve enrollments. One model for a stable position would be to consider future full-time faculty hires in the division with teaching equivalency in one of the major STEM discipline like Biology, chemistry, Math, Physics or computer science AND engineering. For e.g. Professor Lance Lund a long time adjunct instructor has equivalency in engineering and Math.

2. **Increasing success of students across modalities:** As discussed in Sec 8C, engineering shows a significant gap between success rates in face-to-face modality classes versus those that are online and/or synchronous. The finding itself is NOT surprising since it supports the well-known idea that collaborative work in engineering study as well as the engineering workplace is a critical part of success in this field. It is very likely that the need to continue offering online only classes will continue to grow. Therefore, we will plan to tackle this issue in a couple of ways.

- One is to highlight and emphasize modality success rate data to students at the time of enrollment, either through discussions with counselors or through college-level data, so that students are better informed when they make a choice.
- The second is to incorporate class interaction and collaboration activities for the online classes through a potential grading scheme that stresses on real-time student interactions (rather than discussions or other message-based interactions that occur at user convenience).

Program Review

3. **Apply data-driven outcomes from grant funded research on student success through career exploration requirements**: Currently, data is being generated to assess if students show a distinct differences in their curriculum choice, success in STEM classes and transfer choices when they are exposed to career exploration activities like job shadows, mentoring, site visits and internships. Based on the findings from this data, it is quite likely that requiring students to participate in a minimal number of career exploration activities could be part of the course objectives in certain engineering classes, especially ENGR 100.
4. **Integrate manufacturing across engineering classes**: Manufacturing jobs are in constant demand in the bay area, broader region and nation wide. The CORs of various engineering classes do not specifically require "manufacturing" as as specific skill, although hands-on experimentation, data analysis, application of knowledge, technical communication, etc. are all desirable skills and part of the programs PLOs. What is currently missing is the exposure of students to state-of-art manufacturing tools like CNC machining, 3D printing, Laser cutting, etc. The program has aging 3D printers that have become very unreliable and have not been successfully used across several classes like ENGR 100, ENGR 210 and ENGR 270. The goal over the next cycle will be to build this capability through resource requests.

5. **Funded work study Student or intern to support laboratory, outreach and marketing**: The programs ability to consistently offer high-quality laboratory experience to students from term to term could benefit tremendously from having a student assistant. For example, the current available 3D printers are largely dysfunctional due to inability for instructor or other staff on campus to dedicate the time necessary to get them back on track. Hiring a student with interest in technical work to diagnose and fix issues related to various lab equipment can save resources. Likewise, a student who can help with program outreach through creating contacting bay area and regional employers interested in providing a variety of career exploration activities and creating a database of this information would be of benefit not only to the engineering program but also to the entire division. This student could also work closely with the marketing department to help market the program through its social media channels.

Next Step: If your program is requesting resources, please go to "STEP 2: Resource Request (OPTIONAL)" and submit your specific requests there. Otherwise, this is the last prompt in the comprehensive program review form.

Supporting Information

General Supporting Documents
engineering_labor_report.pdf;
engineering_cpr_data_2024v2.docx;
engineering_course_enrollment_report_2024.xlsx

Personnel - Classified Staff (2024 - 2025)

Requested Year
2024 - 2025

Hiring Division/Department:
Science and Technology - Engineering

Position Title:
Laboratory Technician

Status
New Request – Active

Is this position permanent?
Yes

Position Type
Part-time

If Part-Time, what percentage of Full-Time is this position?
0.48

Provide # of months.
12

Critical Question: How does this resource request support closing the equity gap?
Adding a laboratory technician dedicated to supporting engineering would be a key step in closing equity gaps within our program. This role would provide essential hands-on support and resources, ensuring that all students—regardless of background—have equitable access to the tools and assistance they need to succeed. A lab technician would not only enhance learning experiences but also support students who may have less exposure to technical environments, bridging knowledge and skill gaps. By addressing these disparities, we foster a more inclusive environment that empowers all students to excel in engineering and contribute meaningfully to the field

Critical Question: How does this resource request support Latinx and AANAPISI students?
Supporting Latinx and AANAPISI (Asian American and Native American Pacific Islander-Serving Institutions) students with a dedicated laboratory technician in engineering is vital for fostering equitable learning opportunities. Many students from these backgrounds may not have had the same access to technical resources and experiential learning in their prior education. A lab technician would provide consistent, accessible guidance and hands-on support, helping students build confidence with lab equipment and complex concepts. This support can reduce the intimidation barrier often faced in technical fields, allowing students to fully engage, strengthen practical skills, and feel a stronger sense of belonging and inclusion in the program.

Justification

1. Describe the specific needs for the position requested and the duties of this position in a brief statement.
The part-time laboratory technician will be able to fill in gaps in our current laboratory support structure.

2. Explain how this position aligns with and supports the mission and strategic goals of the college.
The technician will allow us to provide an optimal training environment where students are fully supported.

3. Explain how adding this position will strengthen the department or division.
With the expansion of division offerings (e.g., nights, weekends, dual enrollment, etc.), the existing laboratory support staff is being stretched beyond their capacity. This will have long-term negative implications for the quality of the laboratory courses at the college. Adding a part-time technician will ensure that we are able to continue to offer high quality educational experiences to our students taking lab courses.

Resource Requests

4. Explain how this work will be accomplished if the position is not filled.

The work has required our current technicians to work overtime hours. From both a fiscal and humanity perspective, this is not sustainable long-term. We should not have to push our lab staff to burnout just to maintain normal laboratory operations.

5. Critical Question: How does this resource request support closing the equity gap?

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Map Request to College Goals and Strategic Initiatives.

Which of Cañada College's Goals does this resource request support?

Student Access and/or Success and/or Completion
Accessible Infrastructure and Innovation
Equity-Minded and Antiracist College Culture

Which of Cañada College's Strategic Initiatives does this resource request support?

Connect students to the academic program(s) and classes they need
Support innovative teaching that creates more equitable and antiracist learning environments
Strengthen the college culture of continuous assessment and improvement in order to ensure all programs effectively serve students and close equity gaps
Be the best college choice for local high school students
Strengthen K-16 pathways and transfer
Provide adequate access to technology
Manage resources effectively

This position has been reviewed by the department or division and is recommended for hiring.

Dean/Director/Hiring Supervisor Name

Ameer Thompson

Date

11/01/2024