



C U Y A M A C A  
• C O L L E G E •

# Comprehensive Program Review Report

Academic - Engineering (ENGR) - (MS&E)

# Program Goals

Increase student success in sophomore-level engineering courses through increased support for ENGR 100 and all other lab classes. (Goal 1)

**Program Goal:** Increase student success in sophomore-level engineering courses through increased support for ENGR 100 and all other lab classes.

**Goal Status:** Active

## Mapping

2022 - 2028 Strategic Plan: (X)

- **Eliminate Equity Gaps in Course Success:** Increase student success in sophomore-level engineering courses through increased support for ENGR 100 and all other lab classes. (X)
- **Increase Completion and Eliminate Equity Gaps:** Increase student success in sophomore-level engineering courses through increased support for ENGR 100 and all other lab classes. (X)
- **Increase Persistence and Eliminate Equity Gaps:** Increase student success in sophomore-level engineering courses through increased support for ENGR 100 and all other lab classes. (X)

## Summary of Progress or Results

**Summary Date:** 09/20/2024

**Summary of Progress or Results:** Engineering data reviewed in the program review states it is going well! So we will continue our efforts.

**Reporting Period:** 2024 - 2025

**Status:** In Progress - will carry forward into next year

**What resources, if any, are needed to achieve this goal? (Select all that apply):** New classified position, Supplies, equipment, and/or furniture

### Action steps for this academic year.:

Our program review highlights the positive impact of our hands-on, project-based learning approaches and faculty professional development initiatives focused on teaching pedagogy and a DEI (Diversity, Equity, and Inclusion) mindset. These efforts have successfully closed equity gaps in access to the program and reduced equity gaps in retention and success rates. While gaps still exist, our data indicates a strong trajectory toward closing these disparities. To continue this progress and sustain our efforts, we are requesting the following resources:

### Hire a New Classified Position

Our engineering program urgently needs a lab technician to support the growing number and complexity of labs we offer. As we expand our lab-based curriculum, additional support is essential to ensure that our labs operate efficiently and effectively, providing students with a consistent and high-quality learning experience.

### Request for Supply Budget Augmentation

The current supply budget for the engineering program is relatively small compared to other STEM and engineering programs. With increasing enrollment, an expanded range of course offerings, and a strong emphasis on project-based learning, additional funding is crucial to maintain and enhance the quality of our program. This support will ensure students have access to the resources needed for hands-on learning.

### Request for Technology - MATLAB License Augmentation

To improve student success and enrich their learning experiences, we aim to expand access to MATLAB across all engineering courses, not just the MATLAB-specific course. Broader access to this critical tool will better prepare students for real-world engineering applications, enhancing their academic experience and career readiness.

### Request for Supplies - Arduino Kits

# Program Goals

## Summary of Progress or Results

In Spring 2025, we plan to offer five sections of engineering courses that will utilize Arduinos for classroom projects. Over the years, increased usage of Arduinos across courses has led to higher demand, compounded by wear and tear, and some devices have become unusable. To meet the growing need and replace non-functional units, we are requesting additional Arduino kits to support these hands-on learning opportunities.

These resources are vital to continuing our work in reducing equity gaps and advancing the success of our engineering students. By securing these tools and support, we can further enhance the quality and accessibility of our program while preparing students for academic and professional success.

## Create Makerspace to support labs, student projects, engineering club, and national competition teams. (Goal 2)

**Program Goal:** Create Makerspace to support labs, student projects, engineering club, and national competition teams

**Goal Status:** Active

### Mapping

2022 - 2028 Strategic Plan: (X)

- **Eliminate Equity Gaps in Course Success:** Create Makerspace to support labs, student projects, engineering club, and national competition teams (X)
- **Increase Completion and Eliminate Equity Gaps:** Create Makerspace to support labs, student projects, engineering club, and national competition teams (X)
- **Increase Equitable Access:** Create Makerspace to support labs, student projects, engineering club, and national competition teams (X)
- **Increase Persistence and Eliminate Equity Gaps:** Create Makerspace to support labs, student projects, engineering club, and national competition teams (X)

## Summary of Progress or Results

**Summary Date:** 09/20/2024

**Summary of Progress or Results:** Efforts to be continued

**Reporting Period:** 2024 - 2025

**Status:** In Progress - will carry forward into next year

**What resources, if any, are needed to achieve this goal? (Select all that apply):** New classified position, Supplies, equipment, and/or furniture

### Action steps for this academic year.:

Currently, our engineering program has several key pieces of equipment that could form the foundation of a robust Makerspace, with six large-volume 3D printers being the centerpiece. However, a true Makerspace extends beyond just 3D printing, incorporating simpler machinery and hand tools to allow students to design, create, and innovate across various mediums, such as wood, metal, and plastics. Unfortunately, we lack the space to expand for additional equipment and the personnel to oversee operations. Presently, the Makerspace is only accessible to students when the full-time faculty member is available. Compounding these challenges, the pending demolition of the F-building, where the Makerspace is housed, underscores the need for a more central and accessible location to ensure its continued operation. To address these issues, we are pursuing the following actions to improve and expand the Makerspace for our students:

### Hire a New Classified Position

## Program Goals

### Summary of Progress or Results

Our program urgently needs a lab technician to manage and maintain the growing number of labs and the Makerspace. These resources are vital to the success of our program, but without dedicated support, sustaining their operation and upkeep is becoming increasingly difficult. A lab technician would ensure the equipment remains functional, organized, and accessible, significantly enhancing student learning opportunities.

### Request for Supply Budget Augmentation

The engineering program's current supply budget is disproportionately small compared to other STEM and engineering programs. With increasing enrollment, expanded course offerings, and a strong emphasis on project-based learning, additional funding is essential. Enhanced financial support would not only cover necessary supplies and maintenance but also improve accessibility to the Makerspace for all Cuyamaca students, fostering creativity and innovation across disciplines.

### Identify a New Makerspace Location

Initially, the Makerspace was planned to move alongside the engineering program into the new F-building. However, this relocation is no longer feasible. As the current F-building is slated for demolition, we are actively exploring alternative locations that would provide a more central and accessible space for the Makerspace. Our goal is to secure a location that supports the growth and sustainability of this vital resource for both our students and the larger campus community.

These action steps are essential to addressing the current challenges, improving student access, and ensuring the Makerspace can continue to serve as a hub for innovation, creativity, and hands-on learning.

### Partner with CE and the Career Center to get students better connected to their goals. (Goal 3)

**Program Goal:** Partner with CE and the Career Center to get students better connected to their goals

**Goal Status:** Active

### Mapping

2022 - 2028 Strategic Plan: (X)

- **Increase Completion and Eliminate Equity Gaps:** Partner with CE and the Career Center to get students better connected to their goals (X)
- **Increase Equitable Access:** Partner with CE and the Career Center to get students better connected to their goals (X)
- **Increase Persistence and Eliminate Equity Gaps:** Partner with CE and the Career Center to get students better connected to their goals (X)

### Summary of Progress or Results

**Summary Date:** 09/20/2024

**Summary of Progress or Results:** First steps completed, continuing onward.

**Reporting Period:** 2024 - 2025

**Status:** In Progress - will carry forward into next year

**Action steps for this academic year.:**

We plan to hold our second advisory board meeting in Spring 2025 to further evaluate and align our curriculum with industry needs. In Fall 2024, our engineering program successfully passed industry verification for the next three years, paving the way for new job and internship opportunities for our students.

# Program Goals

## Program Overview and Update

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**Lead Author**

Keenan Murray

**Dean/Manager(s)**

Tammi Marshall

**Initial Collaboration Date with Dean**

12/11/2024

## Program Reflection and Description

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**Provide your program's mission statement. If your program does not have a mission statement, what is your timeline for creating a mission statement?**

Our program aims to expose curious minds to the field of engineering, to provide an engaging hands-on engineering education to

prepare students for transfer to 4-year universities and their careers, and to share engineering with the community.

**Is the program description in the current college catalog up to date and accurate?**

Yes

**If you answered no above, what steps will you take to revise the college catalog description?**

It is accurate but lacks detail. We will work to improve it before the next comprehensive program review.

**Describe how your program advances the College's vision of equity, excellence, and social justice through education. How does the program reflect the College's mission and values?**

The engineering program at Cuyamaca College plays a pivotal role in advancing the institution's vision of equity, excellence, and social justice through education. By aligning its practices and initiatives with the College's mission and values, the program fosters an inclusive, student-centered environment that promotes social and economic mobility.

**Advancing Equity**

The engineering program demonstrates a strong commitment to equity by diversifying its faculty pool to ensure students see themselves represented in their instructors. This initiative not only creates a welcoming and inclusive atmosphere but also enriches the faculty's collective knowledge base, fostering a more holistic understanding of diverse student needs. Additionally, the program has worked diligently to reduce the cost of textbooks and supplies, removing financial barriers and ensuring equitable access to resources for all students.

**Excellence in Education**

By continuously updating its curriculum to meet industry standards and transfer requirements, the program ensures students receive a high-quality, relevant education. The shift toward hands-on, project-based learning enhances student engagement and prepares students with practical skills essential for success in their academic and professional journeys. Faculty participation in professional development programs, such as EMTLI and Humanizing STEM, further underscores the program's dedication to teaching excellence and fostering meaningful connections with students.

**Promoting Social Justice**

The engineering program actively supports social justice by creating pathways that empower students to achieve their academic and career goals. Clarifying these pathways helps students understand where to begin, what steps to take at Cuyamaca College, and how to transition to the next stage of their academic journey. This structured guidance supports historically marginalized and underrepresented students by simplifying their navigation through complex educational systems.

**Reflecting the College's Mission and Values**

- **Student-Centered:** The program prioritizes students by tailoring the curriculum to their needs, adopting innovative teaching methods, and actively seeking their input to improve educational outcomes.

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- **Equity:** Through intentional efforts to address financial, cultural, and systemic barriers, the program strives for students to have the opportunity to thrive in an equitable and supportive environment.
- **Innovation:** By embracing hands-on, project-based learning and integrating cutting-edge tools and techniques, the program models innovation and prepares students for success in a rapidly evolving industry.
- **Excellence:** The program's emphasis on maintaining a high standard of education reflects the College's commitment to fostering continuous growth and achievement for students and faculty alike.
- **Community and Social Justice:** The program's actions contribute to building a community that values diversity, inclusion, and systemic change to dismantle barriers and promote social equity.

## Curriculum Review and Development

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**Have all of your active course outlines been reviewed within the last five years?**

Yes

**Please list any planned changes from the current semester forward for curriculum (courses, degrees, and/or certificates) and the rationale for those changes.**

We are continuously expanding our course offerings to align with SDSU transfer requirements, as the majority of our students transfer there. In Fall 2023, we began developing an ENGR course that articulates with SDSU's CON E 101, a crucial course for students pursuing construction management, construction engineering, or civil engineering programs. In Spring 2025, we will offer two new courses for the first time, ENGR-103 and ENGR-230, designed to enhance articulation pathways for our engineering students transferring to SDSU.

ENGR-103, an Environmental Engineering seminar, represents our first step toward establishing a dedicated Environmental Engineering pathway to SDSU. Fortunately, the Civil, Environmental, and Construction Engineering pathways share significant overlap, simplifying alignment efforts.

ENGR-230, a Mechatronics course, addresses SDSU's updated requirements for mechanical engineering students. Previously, students could fulfill this requirement by taking our ENGR-210 Circuits course. However, with SDSU's shift to mandate Mechatronics for all mechanical engineering students, we responded by creating ENGR-230 to meet this need. These additions ensure our program continues to provide students with the courses they need for a seamless transfer and academic success at SDSU.

**For Transfer Programs: How is your program meeting the transfer needs of students, and/or articulation with four-year institutions? If not a transfer program, please enter N/A**

We consistently tailor our course offerings and engineering degrees to align with SDSU's transfer pathways, as most of our students aim to transfer there. To further enhance our transfer opportunities, we plan to strengthen our engineering pathways to UCSD, responding to the growing interest among our students in attending UCSD.

**For Career Education Programs: How is your program meeting labor market demand and preparing students to enter the workforce? If not a career education program, please enter N/A**

N/A

## Student Learning Outcomes (SLO) Assessment

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**Please upload an updated, current version of your SLO assessment plan. (Ideally, the updated plan should specify assessment semesters for all service areas over the next 4 years, between this comprehensive program review and the next.)**

[ENGR - Student Learning Outcomes Assessment Plan.docx](#)

**What do your SLO data suggest about student experiences, successes, and challenges in your service area?**

ENGR-100

Our *Introduction to Engineering & Design* course generally has the lowest retention and success rates compared to other engineering courses. We last evaluated the course with Fall 2021 SLO data when all evaluated students successfully achieved the SLOs. The SLOs were assessed with projects that we have developed during and post pandemic. This correlates well with our increases in retention and success rates of 81% and 51% in Fall 2019 to 91%

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and 72% Fall 2023. Our goal has been to use project based learning in our engineering courses to better engage and serve our students, with a heavy focus on ENGR 100 as the foundation for student retention and success. Our goal combined with SLO data and ENGR 100 retention and success rates suggest our project-based learning implementations are helping our students be engaged and successful in our ENGR 100 course.

### ENGR-225

Our *Mechanics for Civil Engineers* course was first offered in Spring 2023 and I have taught the course each semester so far. I submitted SLO assessment data from Spring 2024. I used a combination of projects, HWs, and Exams to assess the SLOs and the course achieved the SLO goals. Retention rates have been high in the course, ranging from 90-100%. Similarly, success rates have been high ranging from 88-97%. The data suggests that including projects into the curriculum is increasing retention and success rates, similar to our ENGR-100 data.

### ENGR-260

Our *Materials* course tends to be a second-year course. The SLOs were assessed in Spring 2022 with very high SLO achievement rates. The SLOs were assessed using HW and mostly a capstone project. The SLO data included comments from the students appreciating the project-based learning opportunity. The success rates for the course have fluctuated between 70-100% over the past 4 years, with 2 semesters below 70% success rate. When the SLOs were assessed, the course had a 83% success rate, which correlates well with the SLO assessment. This tells me we need to evaluate SLOs more than once every 4-years to better understand fluctuations in student success.

### ENGR-270

Our *Digital Design* has been taught by our adjunct Fernando Loera since Fall 2021 with the exception of Spring 2023. Fernando assessed the SLOs the first semester he taught and high percentages of students achieved the SLOs. This aligns with the student retention and success rates that usually ranged 90-100% and success rates typically in the 80-100% range. Good work Fernando!

### \*\*Side note

We have been behind in assessing SLOs, especially with SLO updates in the past few years. I formally entered SLO data for ENGR-200, ENGR-220, ENGR-225, and ENGR-100 (courses I have taught) and will work with adjuncts to assess SLO in other courses.

### **Share an example of meaningful, innovative, equitable, and/or student-centered SLO assessment happening in your program.**

We have dedicated significant time and effort to developing projects for SLO assessments, as they offer a comprehensive view of student knowledge rather than a single snapshot. We hypothesize that incorporating project-based learning enhances student engagement, retention, and success. The data presented above suggests that our hypothesis may indeed be valid.

### **Discuss how your SLO data are being used for course and/or program improvements for student retention, success, and/or goal achievement.**

We began implementing project-based learning during and after the pandemic, driven by the hypothesis that it would enhance student engagement, retention, and success. The data supports this hypothesis, and we remain committed to exploring new and improved ways to integrate project-based learning across the entire engineering curriculum.

## Degree and Certificate Programs

**For each degree and certificate indicate how many awards were conferred in the past five years. Please comment on any trends and provide context to explain any increases or decreases.**

Degree	# awarded over past 5 years
Civil Engineering	11
Electrical and Computer Engineering	13
Mechanical and Aerospace Engineering	50



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The number of engineering degrees we award remains disproportionately low compared to the number of engineering students who transfer. Although we have updated our engineering degrees to align with SDSU's transfer pathways—our primary feeder school—these efforts have not yet resulted in an increase in degrees awarded. It is unclear whether this is due to a lack of awareness about the degree updates, the absence of a degree requirement for transfer, or other unforeseen barriers. In recent years, we have updated the Civil and Mechanical & Aerospace Engineering degrees, and we will monitor the outcomes during the next comprehensive program review cycle to assess whether these changes lead to an increase in degrees awarded.

**Indicate when each degree and certificate was last reviewed and updated (semester), if this information is available (e.g., via internal program records or Curriculum Committee minutes).**

Civil Engineering - updated Spring 2023

Mechanical & Aerospace Engineering - updated Fall 2023

Electrical and Computer Engineering - Updated Spring 2023 (however this degree needs further reviewing to better represent transfer pathway to SDSU. For example, these students do not need to take our ENGR-100 course to transfer to SDSU and we will most likely remove the course from the degree)

**Can students complete the degree/certificate requirements within a two-year period?**

Yes

**How is your program currently assessing its PLOs? Please select all that apply.**

SLO-to-PLO Mapping

**Please provide the following for each degree/certificate: ? The most recent semester each of your program(s) assessed PLOs; ? Brief summary of findings; and ? Overview of changes made as a result.**

Improving the assessment and utilization of Program Learning Outcomes (PLOs) is an area where our program needs significant growth. I, Keenan Murray, began teaching in the engineering department in 2019. That same year, in Fall 2019, we hired a second full-time faculty member to support the program's teaching and operations. However, the pandemic disrupted our progress, and my first comprehensive program review, prepared during Fall 2020 and submitted in Spring 2021, identified a clear need to enhance both SLO (Student Learning Outcomes) and PLO assessments.

Since then, several challenges have impacted our ability to address this need. After the last comprehensive program review, our second full-time faculty member left the program, we transitioned back to face-to-face classes, and a new full-time faculty member was hired in Spring 2023. Unfortunately, this new faculty member has been on leave since Spring 2024, with no resolution on their return. During this period, our division also experienced turnover, with three different Deans managing our program. This series of disruptions has created significant instability, forcing PLO assessments to take a backseat.

I would greatly benefit from in-person, face-to-face training on PLO assessments. Miriam Simpson, my department co-chair, has generously assisted with tasks I've struggled to manage, but my current understanding of PLOs is limited to mapping SLOs to PLOs to meet legal requirements. I lack the training and insight to analyze PLO data effectively and use it to propose meaningful program changes. I welcome the opportunity to develop my skills in PLO training, assessment, and data application to better serve our program and students.

**Are all of your degree maps completed?**

No

**If you answered "No" above, what are your plans to complete the degree maps for your program?**

We have been actively working on creating degree maps while simultaneously updating the engineering curriculum to better meet our students' transfer needs. Moving forward, we will continue to adapt our curriculum and make corresponding adjustments to degree maps to ensure alignment with these goals.

**Are the degree maps posted to the college website?**

No

**If you answered "No" above, what are your plans to publish the degree maps for your program?**

Yes, degree maps are available on the website, but the information is outdated. Assistance in updating these maps would be greatly appreciated. If support is not available, I will prioritize dedicating time in the future to collaborate with our counselors to ensure the degree maps are updated and accurate.

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### **How are you currently assessing your PLOs? If you are not currently assessing PLOs, what is your plan to assess PLOs in the future?**

No, I have not been actively assessing PLOs.

I understand the basic approach to PLO assessment, which involves using SLO assessment data and mapping it to PLOs. However, I would greatly appreciate support in developing a deeper understanding of how to assess PLOs meaningfully and recognize their broader significance beyond merely providing a snapshot of program success or failure and meeting legal requirements.

Our program has faced significant turnover, including the potential departure of a second full-time faculty member and three different Deans over the past four years. This instability has made it challenging to prioritize responsibilities such as PLO assessment. I am hopeful that the faculty and administrative structure of our program will stabilize soon, allowing for more support and time to fully address the breadth of my responsibilities as chair, including PLO assessments.

### **How are your PLO assessments informing improvements/changes to your program?**

PLO assessments are not currently informing improvements/changes to our program.

## Student Access and Achievement

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### **Please describe any enrollment changes (increases/decreases) over the past 4 years and the context for these changes.**

Over the past four years, enrollment in the engineering program has experienced notable fluctuations due to various factors. During the Spring terms, enrollment declined from 388 in Spring 2020 to 290 in Spring 2022, largely reflecting the challenges of the COVID-19 pandemic, including the transition to remote learning and student hesitancy during uncertain times. However, post-pandemic efforts led to a rebound, with enrollment increasing to 369 in Spring 2023 and stabilizing at 358 in Spring 2024. Similarly, Fall term enrollment saw a decrease from 312 in Fall 2019 to 252 in Fall 2022, also influenced by pandemic-related disruptions. By Fall 2023, enrollment rose to 301, indicating recovery and the effectiveness of measures to re-engage students.

The pandemic had a significant impact, disrupting course delivery and student engagement, which contributed to enrollment declines between 2020 and 2022. To address these challenges, the program adapted by introducing more online and hybrid courses, which helped stabilize and rebuild enrollment. Additionally, curriculum changes to align with transfer pathways, particularly those tailored to SDSU, have supported the recovery as students now see clearer pathways for academic progression. The introduction of new courses articulating with SDSU's requirements further contributed to the positive enrollment trends in 2023.

### **If your program has seen a significant decline in enrollment over the past 4 years, what resources or support would be helpful to improve program enrollment and access?**

Our enrollment has returned to pre-pandemic levels, accompanied by improved student success rates compared to those seen before the pandemic.

### **What is the program doing to increase student enrollment or access?**

The majority of our engineering students aim to transfer to SDSU, and as such, we continually tailor and expand our curriculum to meet their transfer needs. For instance, SDSU recently combined Statics and Dynamics into a single course to reduce the units required for Civil Engineering graduates. In response, we developed an equivalent course and offered it for the first time in Spring 2023. Although initial enrollment was modest with 10 students, it surged to 31 students in Spring 2024. This course also attracts "reverse transfer students" who seek more flexible scheduling options unavailable at SDSU. To improve accessibility, we offer the course in a HyFlex modality, allowing students to choose the format that best suits their learning preferences and schedules. Similarly, recognizing the need for a new mechatronics course for mechanical engineering students transferring to SDSU, we have prepared to launch this course in Spring 2025. These efforts ensure that our course offerings remain current, responsive to SDSU's requirements, and accessible through diverse modalities.

Additionally, we have been incorporating more project-based learning into our curriculum, which our SLO data indicates enhances student engagement, retention, and success. This approach appears to have positively impacted our reputation, as students often choose our college based on word-of-mouth recommendations about the quality of instruction and breadth of engineering content we offer. According to SDSU, we are the second-largest feeder of engineering students, behind Mesa College. However, unlike Mesa College, we have included a Civil Engineering pathway in our program. Historically, Mechanical and Civil Engineering pathways overlapped

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significantly, but as SDSU moves toward more specialized courses, we have proactively adapted to these changes. For instance, while Mesa College has not yet introduced the new mechatronics course for mechanical engineering students required by SDSU, we are prepared to offer it in Spring 2025, further solidifying our commitment to meeting student and transfer institution needs.

Finally, I must credit our adjunct faculty for their significant contributions to our enrollment growth. We are fortunate to have adjuncts who are both passionate about engineering and dedicated to teaching. For example, Fernando Loera, who has taught ENGR-270 since Fall 2021 (excluding Spring 2023), has achieved retention rates of 90-100% and success rates typically between 80-100%. Their enthusiasm and commitment to student success have not gone unnoticed, and we must ensure they feel supported, welcomed, and valued in their roles. Students have clearly recognized and appreciated their passion, which has greatly enhanced our program's appeal and effectiveness.

### **What is your program's overall course success rate? How has it changed over the past 4-5 years?**

The program's overall course success rate has shown consistent improvement over the past 4-5 years.

In **Spring terms**, the success rate was 81% in Spring 2020, dropped slightly to 77% in Spring 2021 due to pandemic-related challenges, and then rebounded to 81% in Spring 2022. This upward trend continued with 83% in Spring 2023 and reached 89% in Spring 2024, reflecting the program's efforts to adapt and enhance student outcomes.

For **Fall terms**, the success rate started at 72% in Fall 2019, declined to 67% in Fall 2020 during the pandemic, and then gradually improved, reaching 74% in Fall 2021, 76% in Fall 2022, and finally 78% in Fall 2023. These figures demonstrate a steady recovery and ongoing success in meeting students' needs.

Overall, the program has achieved significant progress, with recent years reflecting higher success rates than pre-pandemic levels, indicating the effectiveness of curriculum adjustments, support initiatives, and innovative teaching methods.

### **Which groups are experiencing equity gaps in your program for success rate and/or retention rate?**

#### **African-American/Black Non-Hispanic Students**

African-American/Black Non-Hispanic students consistently show lower success rates compared to other groups, with equity gaps often exceeding 10 percentage points relative to the reference group. These fluctuations are significantly influenced by variable and often low enrollment numbers, ranging from fewer than 10 students in some semesters to a peak of 15 students in Spring 2024 and Fall 2023. Despite these challenges, enrollment among African-American/Black Non-Hispanic students has trended upward over the past four years. This growth highlights the need to evaluate whether current program practices effectively support both the increasing enrollment and the retention and success rates of this demographic.

#### **Hispanic/Latino Students**

Hispanic/Latino students have shown improvements in success rates in recent terms; however, equity gaps persist in certain semesters. For instance, Fall 2023 data reveals notable gaps in both success and retention rates, with success rates lagging by several percentage points. Conversely, in Spring 2024, there were no observed equity gaps in either retention or success rates, demonstrating progress. Continued monitoring and support are necessary to maintain and build upon these positive outcomes.

#### **Middle Eastern or North African Students**

Middle Eastern or North African students occasionally experience equity gaps in success rates, even though their retention rates are generally high. These trends indicate a need for targeted strategies to address the specific challenges that may impact the academic success of this group.

#### **Students of Multiple Races**

For students identifying as belonging to multiple races, success rates have fluctuated significantly across semesters, with some terms showing equity gaps exceeding five percentage points. This variability suggests the need for a closer examination of barriers faced by these students and more consistent support mechanisms.

#### **Observations**

While the engineering program demonstrates strong overall retention and success rates, equity gaps persist for certain demographic groups. African-American/Black Non-Hispanic and Hispanic/Latino students face consistent disparities in retention and success rates, while Middle Eastern or North African students and students of multiple races exhibit occasional but notable gaps.

Recent initiatives, including curriculum adjustments and instructor trainings, may contribute to narrowing these gaps. However, ongoing evaluation, tailored support strategies, and an exploration of potential barriers—such as access to resources, course design, and possibly group specific strategies—will be needed for achieving equity and supporting the success of all student groups.

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### **What department/discipline (or institutional) factors may be contributing to these lower rates of success for these groups of students?**

Retention and success rates across student groups are generally strong and show a positive trend toward closing equity gaps. Instructors have voluntarily, and with encouragement, engaged in DEI (Diversity, Equity, and Inclusion) training, transitioned to project-based learning, and evaluated curriculum adjustments to better support students. These efforts have positioned our program on a promising path toward achieving equity. As we continue to make progress, I anticipate the need to fine-tune our practices and implement solutions tailored to the specific needs of each group to sustain and build on these gains.

### **How has this data shaped your comprehensive program review goals and action steps?**

Our data indicates that our efforts and goals are yielding positive results, so we will continue to build on our current trajectory.

### **Discuss your department/discipline's plan for diversifying department faculty in alignment with the GCCCD Board Resolution 20-015.**

We prioritize hiring with a DEI mindset while adhering to proper hiring procedures to ensure an inclusive and diverse faculty. Beginning in Spring 2025, our engineering department will consist of eight adjunct instructors alongside myself, Keenan Murray. Notably, I am the only faculty member in our team who identifies as a White male, highlighting our commitment to cultivating a diverse faculty pool. We have dedicated significant time and effort to our hiring process to recruit skilled professionals who are not only experts in their engineering fields but also passionate about teaching and inspiring the next generation of engineers.

### **What other qualitative or quantitative data, if any, is the department/discipline using to inform its planning for this comprehensive program review?**

N/A

## Distance Education Course Success (If Applicable)

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### **If your department offers distance education classes, how do you ensure Regular and Substantive Interaction (RSI) is being implemented?**

The program recognizes the importance of strengthening its approach to regular and substantive interaction (RSI) in online courses. To enhance the quality of online teaching, many faculty members have voluntarily participated in additional training focused on fostering a sense of community and valuing the unique contributions each student brings to the course. While we are in the early stages of implementing RSI practices, we remain committed to ongoing training and regularly evaluating our strategies to ensure continuous improvement and meaningful engagement in our online courses.

RSI is particularly critical in my Distance Education (DE) courses offered during the summer semester, where a 16-week course is condensed into just 8 weeks. In this format, regular engagement and active participation are essential for student success. To promote community and meaningful interaction, I have implemented several strategies designed to enhance RSI and student engagement in my courses:

#### **1. Welcome Videos in the First Week:**

During the first week of class, both students and I create and share welcome videos. This activity helps establish a personal connection, fostering a sense of community as we prepare to collaborate on assignments throughout the course.

#### **2. Diverse Weekly Assignments:**

Each week includes a mix of classic analytical homework problems and conceptual prompts requiring written or video responses. For example, some prompts challenge students to explain engineering concepts using language instead of relying solely on mathematical calculations—a skill that many engineering students find difficult but essential for effective communication. Video responses are shared with the class in discussions, encouraging interaction, exposure to diverse perspectives, and deeper conceptual learning.

#### **3. Project-Based Learning:**

Students complete several projects throughout the course, with each project broken into manageable components that must be completed every one to two weeks. This structure encourages consistent

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progress and engagement. Additionally, students design their own projects, which fosters creativity, personal investment, and retention. This approach allows me to provide iterative feedback, ensuring regular interaction with each student and reinforcing RSI principles.

### **If there are differences in success rates for distance education (online) versus in-person classes, what will the program do to address these disparities? If there are no differences, what did the program do to achieve that?**

Our success rates for online courses in Fall semesters are generally higher than those for on-campus courses. However, in Spring semesters, the success rates for online courses remain consistent while on-campus success rates improve significantly. For comparison, on-campus success rates for Fall semesters range from 68% to 76%, whereas in Spring semesters, they increase to a range of 79% to 90%. In contrast, the success rates for 100% online courses, which constitute the majority of DE (Distance Education) students, range from 61% to 82%, regardless of whether it is Fall or Spring semester.

Interestingly, campus-wide data also shows a trend of higher success rates in Spring semesters for on-campus courses, but the trend is more pronounced in our engineering program. Since there are no significant changes in engineering instructors or course offerings between semesters, it suggests that other factors might be influencing the difference in success rates between Fall and Spring. One possibility is that first-time college students, who often begin in the Fall semester, are still acclimating to college life and coursework. By Spring semester, these students may have found their rhythm, leading to improved performance. This highlights the importance of providing robust onboarding for new students.

If these hypotheses are accurate, it could also suggest that online students are not acclimating in the same way as on-campus students. This underscores the need to improve onboarding processes for DE students and to implement strategies to better engage them. The higher success rates observed for on-campus students indicate that our engineering program has the potential for stronger outcomes across all formats, provided we address these disparities in support and engagement.

## Career Exploration and Program Demand (Career Education Programs Only)

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### Strengths, Challenges & External Influences

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#### **Please describe your program's strengths.**

Our program boasts several key strengths that contribute to its success and reputation. We have a diverse faculty pool comprised of experts from a variety of engineering fields, bringing a wealth of knowledge and perspectives to our students. Our instructors are deeply passionate about both engineering and teaching, fostering an engaging and supportive learning environment. This dedication is reflected in the high regard our students have for the program, as evidenced by our status as the second-largest feeder of engineering students to SDSU. Our engineering curriculum is meticulously aligned and articulated with SDSU, ensuring a smooth transfer process for our students. Additionally, we prioritize a student-focused approach by offering a hands-on, project-based curriculum that not only enhances engagement but also prepares students with practical skills for real-world applications.

#### **Please describe your program's challenges.**

Our program faces several significant challenges that impact its operations and growth. One major issue is the high turnover rate among full-time faculty. Over the past four years, we have experienced the resignation of a tenure-track faculty member for a better opportunity, and their replacement is currently on paid leave with an uncertain return status. This situation has left me, Keenan Murray, as the sole full-time faculty member responsible for the engineering program. In Spring 2025, nine instructors are slated to teach in the program, but all except me are adjuncts. While our adjunct instructors are passionate and committed to teaching, most have full-time engineering jobs and are unable to provide additional support for program administration.

Currently, I serve as Chair for Engineering and Earth Sciences as well as Coordinator for Surveying. Despite the breadth of these responsibilities, I receive only 30% reassigned time to manage these three programs. This limited allocation of time makes it impossible to adequately organize, run, and maintain the program. My efforts are often reduced to tackling immediate issues rather than addressing larger strategic needs. I often describe my approach as "throwing spaghetti against the wall to see what sticks," as I lack the capacity to advocate for the more significant needs of the programs I oversee.

## Comprehensive Program Review

Another challenge is the supply budget. When I started in 2019, the yearly engineering budget was only \$900, far below what is typical for other STEM fields, which often have budgets in the tens of thousands of dollars. While the current budget has increased to \$3,000, it is still insufficient compared to what is available to other engineering programs or STEM disciplines across the region.

Equipment maintenance and support present additional hurdles. We manage hundreds of thousands of dollars' worth of engineering equipment used in labs and our Makerspace. However, we do not have a lab technician to assist with regular maintenance or setup. As a result, I am forced to operate equipment until it breaks and then spend money fixing the equipment. Maintaining this equipment is not part of my job description, nor do I have the time to handle it effectively. Lab instructors volunteer their time to set up equipment for their classes, which is also outside their job responsibilities. Over the past few years, we have updated our curriculum to be more project-based and hands-on, acquiring new equipment to support these changes. This shift has resulted in improved retention and success rates among students. However, despite repeated requests for a lab technician, we have yet to receive support. Meanwhile, other STEM fields have lab technicians—sometimes even multiple technicians—to support their programs. This disparity significantly hinders our ability to sustain and grow the engineering program.

### **Please describe external influences that affect your program (both positively and negatively).**

The majority of our students aim to transfer to SDSU, so we have carefully aligned our curriculum and articulation agreements with SDSU's requirements to ensure their successful transfer. This alignment has fostered an active and collaborative relationship with SDSU faculty, department chairs, and administrators. However, a significant challenge arises from this collaboration, as SDSU's evolving curriculum often dictates the structure and offerings of our engineering program.

In recent years, SDSU has begun to modify and specialize its engineering courses by discipline. For example, SDSU condensed its Statics and Dynamics courses into a single combined course for civil engineering students. As a result, we now have to offer separate Statics and Dynamics courses for mechanical engineering students, along with the new combined Statics/Dynamics course for civil engineering students. Similarly, mechanical and electrical engineering students once shared the same Circuits course, but SDSU now requires mechanical engineering students to take a Mechatronics course instead.

This increasing specialization has led to several challenges for our program. It requires us to offer multiple similar courses, which increases the demand for equipment and resources. At the same time, it heightens the risk of course cancellations due to low enrollment caused by the segmentation of students into specialized tracks.

Navigating these complexities requires a significant and intentional investment of time to manage our relationship with SDSU and to develop and implement new courses.

Fortunately, we have managed to adapt to these changes so far. An unexpected benefit has been the enrollment of some SDSU students in our courses, which has helped mitigate concerns about low enrollment. This dynamic underscores the importance of maintaining flexibility and a proactive approach in managing our program's evolving needs.

### **Given these factors, what opportunities exist for the service area to advance the College's goals in the next 4 years?**

Over the past four years, the engineering program has been implementing a DEI-focused, student-centered curriculum that emphasizes hands-on, project-based learning. Our data indicates that the demographic diversity of our enrolled engineering students now closely mirrors the overall college population, with gender representation being the primary exception. Additionally, we have made significant progress in closing equity gaps in retention and success rates.

Our work is far from finished, as we continue to evolve our curriculum to better meet student needs while actively seeking equipment and resources to support these efforts. Building on the successes of the past four years, we remain committed to advancing the College's goals by fostering equity, inclusion, and student success through innovative and responsive educational practices.

## Program Goals

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### **Program Goals Status**

I have updated the progress on my previous goals.

### **Program Goals Mapping**

Mapping for all active Program Goals complete.

