CUYAMACA COLLEGE

Comprehensive Program Review and Dean Feedback Report

Academic - Physics (PHYC) - (MS&E)

Physics ZTC

Program Goal: Develop zero cost textbook strategies for PHYC 110, 201, 202, 203
Goal Status: Active

Mapping
2022 - 2028 Strategic Plan: *(X)*

- **Increase Equitable Access:** Develop zero cost textbook strategies for PHYC 110, 201, 202, 203 (**X**)
- **Eliminate Equity Gaps in Course Success:** Develop zero cost textbook strategies for PHYC 110, 201, 202, 203 (**X**)
- **Increase Persistence and Eliminate Equity Gaps:** Develop zero cost textbook strategies for PHYC 110, 201, 202, 203 (**X**)
- **Increase Hiring and Retention of Diverse Employees:** Develop zero cost textbook strategies for PHYC 110, 201, 202, 203 (**X**)

Summary of Progress or Results
Summary Date: 12/10/2025 **Summary of Progress or Results:** OpenStax and instructor-authored resources adopted for PHYC 110 and 201, 202, 203. 203 needs work. We are working on phase 2 and 3 of the grant to improve the content. **Reporting Period:** 2025 - 2026 **Status:** In Progress - will carry forward into next year
Summary Date: 10/02/2025 **Summary of Progress or Results:** Physics 110, 201, 202, 203 are all ZTC. **Reporting Period:** 2025 - 2026 **Status:** In Progress - will carry forward into next year **Action steps for this academic year.:** Finish the edits for ZTC equity project Make the text for Physics 203 better Make sure the resources are useable for all

Lab Updates

Program Goal: Create a more streamlined, student-centered lab program by
1. finishing the lab inventory and connecting it to all the labs (all classes)
2. Lab manuals for students and instructors, including accessibility and live updating embedded into Canvas
3. Revise 201, 202, and 203 labs to be more scaffolded to get students to measure, evaluate data, design experiments, and present results.
4. This needs to include online labs, maybe?
a. For online classes
b. For in-person classes to have optional flexibility
Goal Status: Active

Mapping

2022 - 2028 Strategic Plan: *(X)*

- **Increase Equitable Access:** Create a more streamlined, student-centered lab program by
  1. finishing the lab inventory and connecting it to all the labs (all classes)
  2. Lab manuals for students and instructors, including accessibility and live updating embedded into Canvas
  3. Revise 201, 202, and 203 labs to be more scaffolded to get students to measure, evaluate data, design experiments, and present results.
  4. This needs to include online labs, maybe?
  a. For online classes
  b. For in-person classes to have optional flexibility (**X**)
- **Eliminate Equity Gaps in Course Success:** Create a more streamlined, student-centered lab program by
  1. finishing the lab inventory and connecting it to all the labs (all classes)
  2. Lab manuals for students and instructors, including accessibility and live updating embedded into Canvas
  3. Revise 201, 202, and 203 labs to be more scaffolded to get students to measure, evaluate data, design experiments, and present results.
  4. This needs to include online labs, maybe?
  a. For online classes
  b. For in-person classes to have optional flexibility (**X**)
- **Increase Persistence and Eliminate Equity Gaps:** Create a more streamlined, student-centered lab program by
  1. finishing the lab inventory and connecting it to all the labs (all classes)
  2. Lab manuals for students and instructors, including accessibility and live updating embedded into Canvas
  3. Revise 201, 202, and 203 labs to be more scaffolded to get students to measure, evaluate data, design experiments, and present results.
  4. This needs to include online labs, maybe?
  a. For online classes
  b. For in-person classes to have optional flexibility (**X**)
- **Increase Hiring and Retention of Diverse Employees:** Create a more streamlined, student-centered lab program by
  1. finishing the lab inventory and connecting it to all the labs (all classes)
  2. Lab manuals for students and instructors, including accessibility and live updating embedded into Canvas
  3. Revise 201, 202, and 203 labs to be more scaffolded to get students to measure, evaluate data, design experiments, and present results.
  4. This needs to include online labs, maybe?
  a. For online classes
  b. For in-person classes to have optional flexibility (**X**)

Summary of Progress or Results
Summary Date: 12/10/2025 **Summary of Progress or Results:** Lab Inventory with Health and Safety Measures **Reporting Period:** 2025 - 2026 **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 **Action steps for this academic year.:** This is an ongoing project in when we are inventorying all our equipment including instruction manuals, notes, and maintenance logs and keeping it all in

Summary of Progress or Results
airtable for easy access to all faculty and staff from anywhere. We will also create a central lab manual set for the deparment and cross link equipment with it. This takes a lot of work to get all the equipement entered. 1. Continue to enter equipment (we are about 90% done) 2. Create and enter new lab manuals 3. Add maintenance log stuff
Summary Date: 12/10/2025 **Summary of Progress or Results:** Revise 201, 202, and 203 labs to be more scaffolded to get students to measure, evaluate data, design experiments, and present results. **Reporting Period:** 2025 - 2026 **Status:** In Progress - will carry forward into next year **What resources, if any, are needed to achieve this goal? (Select all that apply):** New faculty position, Technology **Action steps for this academic year.:** We need to overhaul all of the labs for accessibility and better scaffolding to teach skills. This is a major change and much better pedagogically. For each class we need to coordinate faculty and lab staff as well as ensure we have proper equipement. 1. Physics 203 (90% done) 2. Physics 202 (20% done) 3. Physics 201 (20% done) 4. Next we will work on Physics 130, 131, 110 and Astronomy

Operational Health

Program Goal: Get us properly resourced for our growth
Goal Status: Active

Mapping
2022 - 2028 Strategic Plan: *(X)*

- **Eliminate Equity Gaps in Course Success:** Get us properly resourced for our growth (**X**)
- **Increase Hiring and Retention of Diverse Employees:** Get us properly resourced for our growth (**X**)

Summary of Progress or Results
Summary Date: 12/10/2025 **Summary of Progress or Results:** While we now have proper budget and equipment, we are still short staffed and have very poor compensation for chair time. **Reporting Period:** 2025 - 2026 **Status:** In Progress - will carry forward into next year **What resources, if any, are needed to achieve this goal? (Select all that apply):** New faculty position, New classified position **Action steps for this academic year.:** We have doubled in size and now need to increase staff or downsize. We plan to

Summary of Progress or Results

1. Re-class our lab tech to fit the new role
2. Get another faculty member
3. Right-size our chair time for the work we do.

Instructional Excellence

Program Goal: Make high-quality instruction a priority for both Students and Staff
Goal Status: Active

Mapping
2022 - 2028 Strategic Plan: *(X)*

- **Increase Equitable Access:** Make high-quality instruction a priority for both Students and Staff (**X**)
- **Eliminate Equity Gaps in Course Success:** Make high-quality instruction a priority for both Students and Staff (**X**)
- **Increase Persistence and Eliminate Equity Gaps:** Make high-quality instruction a priority for both Students and Staff (**X**)
- **Increase Hiring and Retention of Diverse Employees:** Make high-quality instruction a priority for both Students and Staff (**X**)

Summary of Progress or Results

Summary Date: 12/10/2025
Summary of Progress or Results: SEED is still going strong but we need a better onboarding plan and easier adoptable materials
Reporting Period: 2025 - 2026
Status: In Progress - will carry forward into next year
What resources, if any, are needed to achieve this goal? (Select all that apply): New faculty position, New classified position
Action steps for this academic year.:
Make high-quality instruction a priority for both Students and Staff:

1. Keep running SEED to continuously improve instruction
2. Formalize
    1. hiring practices,
    2. onboarding,
    3. training
3. Standard, centralized course content for all classes that can be used by adjunct faculty (The core of this could be an improved ZTC textbook along with a bank of practice problems and test questions.)

Program Overview and Update

Lead Author
Miriam Simpson

Collaborator(s)
Scott Stambach, Glenn Thurman, Alexandra Neri, Wyatt Crockett, Kevin Graves, Jennifer Olim, Lindsay Lowry

Please briefly share the ways in which you collaborated with colleagues within and outside of your department to gather input to inform your program review.

Discussed goals and resource needs with full-time colleagues via email, messages, and at department meetings. Shared drafts via department discord for feedback from all faculty.

Dean/Manager(s)
Tammi Marshall

Please briefly share the ways in which you collaborated with your Dean on your program review to discuss your vision, goals, and resource needs/requests.
Multiple meetings and shared google doc.

Program Reflection and Description

Provide your program's mission statement. If your program does not have a mission statement, what is your timeline for creating a mission statement?
The Physics and Astronomy program at Cuyamaca College aims to provide high-quality, hands-on education in objective, creative, and scientific thought to all students. We seek to foster curiosity and critical thinking while teaching the scientific and mathematical principles that explain the physical universe. At the same time, we acknowledge the historic inequities within science and actively work to create inclusive, student-centered classrooms that reflect and respect the diverse communities we serv

Is the program description in the current college catalog up to date and accurate?
No

If you answered no above, what steps will you take to revise the college catalog description?
Although both degrees in the 2025–26 catalog are accurate, two updates are needed in future catalogs (as well as the website):

1. **Physics 2.0 ADT:** Released statewide in February 2025, this new version requires Differential Equations, Linear Algebra, and an introductory programming course. Colleges must adopt it within 18 months and then deactivate the current AS-T. CSU will honor the current version through at least 2028. We will need to add the Physics 2.0 ADT in the 2026–27 catalog. Our plan is to submit the new degree for local and Chancellor's Office approval, and clearly mark the existing AS-T as "superseded" when appropriate.

2. **Clarity for Students:** The catalog should more clearly differentiate the degrees. The AS-T guarantees CSU transfer, while the AS (with chemistry) offers stronger preparation for UC and professional/engineering tracks. We will add a UC transfer advisory: *"Students planning to transfer to a UC*

campus should also complete CHEM 141/142 and consult ASSIST.org, as many UC physics and engineering programs require additional chemistry. UC transfer students are also strongly encouraged to meet with a STEM counselor and the Transfer Center for personalized advising."

3. **Website as Complement:** To keep the catalog concise, details about teaching modalities (HyFlex, online, in-person), zero-textbook-cost (ZTC) courses, and project-based labs will not be added to the catalog description. Instead, these program highlights will be posted and regularly updated on the Physics & Astronomy department website, where they can better serve students as current, flexible information.

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 Physics and Astronomy program advances the College's vision of equity, excellence, and social justice through intentional course design, innovative scheduling, and a sustained commitment to high-quality teaching. We have redesigned our scheduling practices to maximize student access, adding more in-person labs post-pandemic while maintaining HyFlex and online options so students can choose the modality that fits their needs. Our program has also made a strong investment in hiring, training, and retaining excellent adjunct faculty. Nearly all of our instructors have completed extensive equity-focused professional development, and our faculty—full- and part-time—have been recognized with multiple campus awards for outstanding teaching and service.

Professional development through **EMTLI** and our **SEED community of practice** has been transformative. These programs provide both full and part time faculty with tools for equity-minded teaching, humanizing STEM, and building inclusive classrooms. SEED in particular has created a culture of shared innovation, allowing adjuncts and full-time faculty to experiment with inquiry-based labs, flipped classrooms, and flexible grading practices while learning from one another. We have also made creative use of our lab technician and student assistants, not only to manage equipment but also to foster a sense of community and continuity across our labs and courses. These programs provide adjuncts with vital connections and support that they can draw on throughout the semester.

Equity and access are also advanced through our commitment to student support. We regularly connect students with resources such as the Cuyamaca Cares food pantry to reduce basic-needs barriers. During the COVID-19 pandemic, our proactive interventions, including high-touch communication, flexible course policies, and embedded supports, resulted in **exceptionally low drop and withdrawal rates**, especially compared to other STEM programs across the district and region.

Enrollment growth has been a hallmark of the past several years. Physics enrollment has more than doubled in courses like PHYC 201 and 202 between 2022 and 2024, while Astronomy has grown but plateaued in recent years. This growth has not only expanded access but also helped us narrow equity gaps while maintaining strong success rates. For example, Physics maintains success rates well above 80%, exceeding college benchmarks. Astronomy has been especially impactful online, where moving courses to virtual formats during and after the pandemic has allowed all students with an accessible GE course while providing older adult students access to astronomy education and, in many cases, opportunities for salary advancement credit.

In short, our program embodies the College's mission and values by integrating equity-minded practices, pedagogical excellence, community engagement, and expanded access. Through faculty training, proactive student engagement, innovative curriculum design, and strong community ties, Physics and Astronomy continues to be a leader in advancing equity, excellence, and social justice in STEM education

Curriculum Review and Development

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

Yes

Comprehensive Program Review

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

Astronomy – Common Course Numbering (CCN)

We are already working with Grossmont faculty on the statewide CCN initiative. Astronomy is included in the Phase II CCN rollout. Locally, we will bring revised course outlines through curriculum in 2025–26, with implementation in the Fall 2026 catalog. This will align our courses with those of other CCCs and CSU/UC, simplify transfer, and enable us to refine course outlines and labs during the transition.

Physics – AD-T 2.0

We are also collaborating with Grossmont on the required update to the Physics Associate Degree for Transfer (AD-T 2.0). Draft revisions have begun, with curriculum submission in Fall 2025 (hopefully) and catalog implementation by Fall 2026 or 2027. This update ensures our degree remains fully aligned with CSU/UC expectations, with clear and efficient pathways for transfer

Please upload the 2-year course rotation(s)/schedule(s) for each associate degree covered by this program review.

Physics Course Rotations.xlsx

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

Our program is deeply focused on ensuring that students have a smooth transfer into UC and CSU STEM majors. Recently, we resolved long-standing articulation issues with UCSD and UC Davis for PHYC 201, 202, and 203 labs by rewriting all labs and scaling back our online offerings while we rework the online labs. During the transition period, we were forced to manually articulate courses on a case-by-case basis, an inefficient and stressful process for students and faculty. We now proactively warn students when an in-person version of a course is required for transfer, particularly in lab science sequences.

Some challenges remain, most notably a Berkeley prerequisite misalignment that has not yet been resolved. To manage these issues, we maintain constant communication with UC/CSU transfer programs. Looking forward, we see a strong need to build better bridges with the Cuyamaca Transfer Center and STEM counseling teams, so students receive consistent, accurate, and early guidance on complex transfer requirements. With our current chair reassigned time, we hopefully will get to this eventually.

Student Learning Outcomes (SLO) Assessment

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.)

SLO_Physics_Plan.xlsx - PHYC F26.pdf

What do your course SLO data over the past 4 years suggest about student experiences, successes, and challenges in your service area?

Across Physics and Astronomy, SLO results from the past four years reveal consistent patterns in student learning that highlight both instructional strengths and targeted areas for improvement.

In Physics, students demonstrate strong conceptual understanding and applied problem-solving skills in mid- and upper-sequence courses (PHYC 202 and 203), where success rates frequently exceed 85–90%. Laboratory-based SLOs, particularly those emphasizing data analysis, modeling, and experimental design, show very high success rates (often 90–100%), indicating that students learn effectively through hands-on, structured inquiry. Communication-focused SLOs (such as presentations, teaching projects, and written explanations) also consistently meet assessment criteria, suggesting that students are developing transferable scientific communication skills.

Challenges in Physics are concentrated in gateway and introductory courses (PHYC 110, 130, and 201), where SLO success shows greater variability. These challenges are most evident in SLOs related to measurement, uncertainty, and multi-step reasoning, particularly in online or HyFlex sections. Homework-based SLO assessments have, at times, obscured actual learning due to non-completion or disengagement, prompting a departmental shift

toward exam-, lab-, and project-anchored assessments. Overall, Physics SLO data suggest that students are most successful when assessments are authentic, scaffolded, and conducted in person, and that early-sequence courses benefit most from additional instructional support.
In Astronomy, SLO data indicate that students are generally successful when engaged in active, observational, or applied learning, with performance closely tied to attendance and assignment completion rather than conceptual difficulty. Across both lecture (ASTR 110) and laboratory (ASTR 112) courses, students demonstrate strong mastery of core astronomical concepts(such as stellar evolution, cosmology, distance measurement, and spectral classification) when assessed through applied or lab-based tasks. Success rates on assessed SLOs are consistently high, typically above 85–90%, particularly when assessments involve hands-on observation, data interpretation, or guided analysis.
Challenges in Astronomy are primarily structural rather than academic. Students who do not meet SLO criteria are most often those who do not attend class sessions, especially in in-person observational labs, or who fail to submit required assignments in online sections. Notably, online lab sections show high success among students who complete and revise assignments, suggesting that persistence and follow-through (rather than modality) are the primary barriers to success.
Taken together, SLO data across both disciplines indicate that students are capable of mastering course outcomes and that success is strongly linked to engagement, attendance, and structured opportunities to apply concepts. These findings continue to inform targeted improvements in assessment design, instructional support, and retention strategies, particularly in early-sequence courses.

Share an example of meaningful, innovative, equitable, and/or student-centered SLO assessment happening in your program.
In recent years, the department restructured course SLOs in both Physics and Astronomy to emphasize skills and scientific practices rather than discrete content topics, reflecting a deliberate pedagogical shift toward authentic assessment of student learning. Rather than asking whether students can recall or reproduce isolated concepts, revised SLOs focus on whether students can apply scientific reasoning, analyze data, and communicate evidence-based conclusions.
In Physics, this shift is particularly evident in gateway and lower-division courses such as PHYC 130 and PHYC 201, where SLOs are increasingly assessed through in-person laboratory investigations and project-based work rather than traditional exams. Examples include students using video tracking software to analyze biological motion, designing and testing simulations (such as energy transfer on a skateboard ramp), and completing multi-week inquiry labs that emphasize data collection, uncertainty analysis, and model comparison. These assessments require students to make assumptions explicit, justify choices, and interpret results, closely mirroring how scientific knowledge is constructed in practice.
In Astronomy, a similar skills-based approach is reflected in laboratory and applied assessments in ASTR 110 and ASTR 112. Students demonstrate learning through hands-on telescope observations, analysis of stellar spectra, use of Hertzsprung–Russell diagrams to determine stellar properties and distances, and the production of formal laboratory reports that integrate data analysis, scientific terminology, and clear written communication. These assessments emphasize observation, interpretation, and synthesis rather than memorization of astronomical facts.
Across both disciplines, these assessments are meaningful because they directly measure transferable scientific skills, increase student engagement while reducing test anxiety, and limit inappropriate AI use by requiring hands-on, observational, or data-driven work. Most importantly, they align closely with program-level outcomes and transfer expectations, reinforcing a shared departmental goal of helping students learn not just physics or astronomy content, but how to think and work like scientists.

Discuss how your SLO data are being used for course and/or program improvements for student retention, success, and/or goal achievement.
SLO data in both Physics and Astronomy are used to guide targeted improvements focused on student engagement, retention, and course success. Across both disciplines, unsuccessful SLO outcomes are most strongly associated with non-attendance and incomplete work, particularly in laboratory and observational settings, rather than conceptual difficulty. As a result, instructors emphasize early communication, clear expectations, and timely intervention when students disengage.
SLO results have also informed changes to assignment design, especially in online and hybrid courses. Assessments are more clearly scaffolded, include structured checkpoints, and provide opportunities for revision, helping distinguish persistence issues from learning challenges. Comparable SLO success rates across face-to-face and online sections support offering multiple instructional modalities while maintaining consistent, skills-based expectations.

Comprehensive Program Review

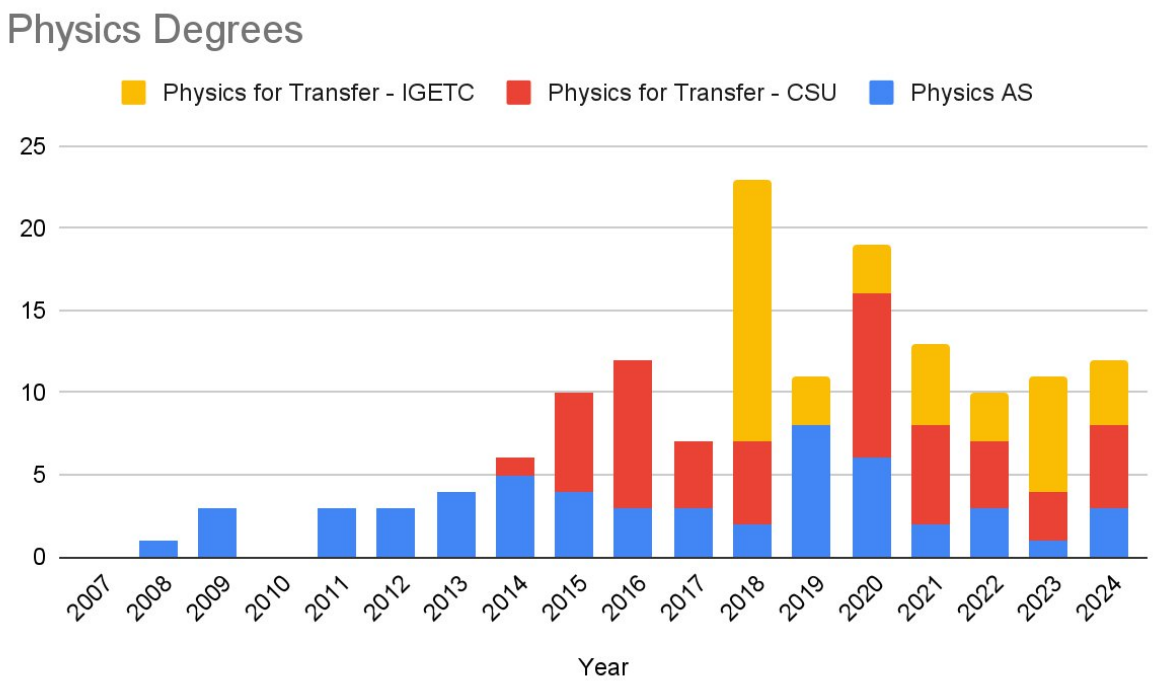
Finally, SLO patterns in gateway courses are reviewed alongside success and retention data to focus resources where they have the greatest impact. High SLO achievement in later courses confirms that students who persist are meeting program goals, while lower attainment in early courses informs targeted support strategies rather than broad curricular changes.

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.

Awards and Trends (2020–2025)

Degree awards understate our impact. Physics majors are few everywhere, but our program is **essential to nearly every STEM pathway** at Cuyamaca and serves as a **GE science gateway** for non-majors, directly advancing equity, transfer, and scientific literacy across the college. Over the past five years, the Physics program has conferred **65 degrees**: 15 local AS, 28 AS-T (CSU Breadth), and 22 AS-T (IGETC CSU), an average of **13 per year**. This is typical for physics, which is a small major nationally (≈8,000 U.S. bachelor's degrees per year), compared with biology (≈100,000).



Why numbers are modest: Most students who take physics are preparing for other STEM degrees, including engineering, chemistry, biology/life sciences (pre-med, allied health, kinesiology), computer science, and geology. Our program offers multiple series to serve these groups:

- PHYC 201/202/203 (calculus-based for physics, engineering, chemistry, computer science)
- PHYC 130/131 (calculus-based for biology and life sciences)

- PHYC 110 (conceptual physics for physical science GE)
- ASTR 110/112 (for physical science GE).

Degrees that include Physics coursework

1. Physics Majors (direct)

- Physics (AS)
- Physics for Transfer – CSU GE Breadth (AS-T)
- Physics for Transfer – IGETC CSU (AS-T)
- Physical Science (older, now discontinued)

2. Engineering Degrees (all require some or all of the calculus-based PHYC 201–203 series)

- Civil Engineering (AS)
- Electrical and Computer Engineering (AS)
- Mechanical and Aerospace Engineering (AS)
- Surveying (AS/Certificate – typically requires PHYC 130 or 201 depending on track)

3. Other STEM degrees that list Physics as a requirement or option

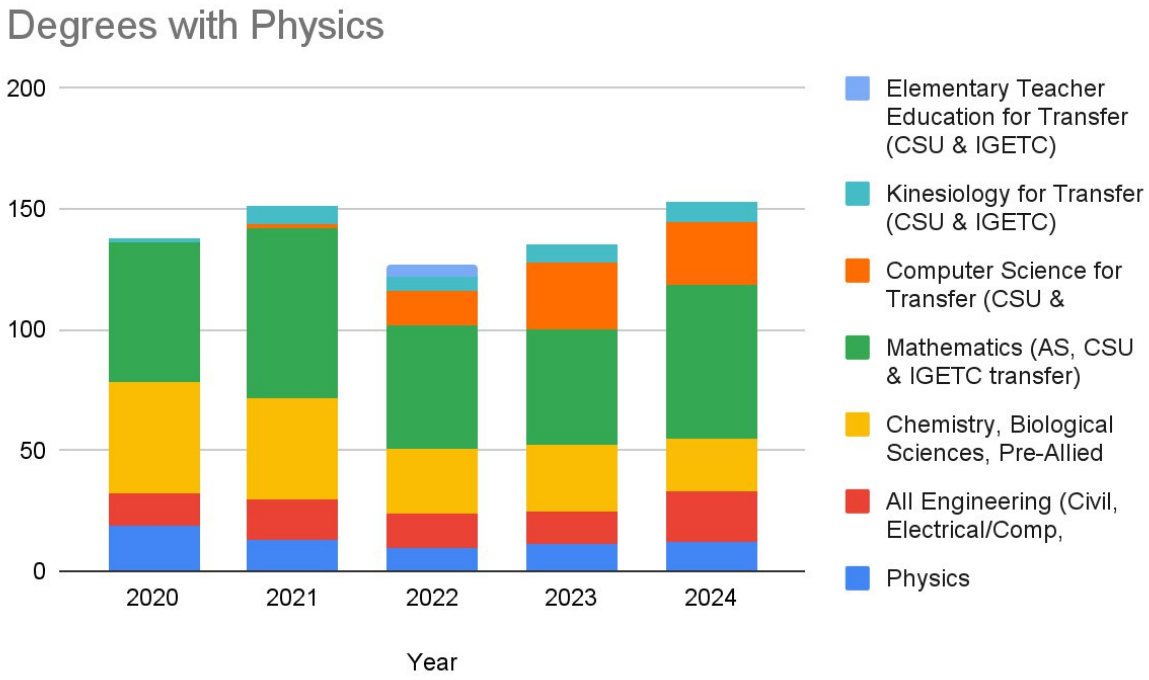
- Chemistry (AS) — requires PHYC 201–202 sequence.
- Biology (AS, AS-T) — often requires PHYC 130/131 (life sciences series).
- Pre-Allied Health / Biological Sciences (AS) — requires PHYC 130 (algebra-based physics).
- Mathematics (AS, AS-T) — requires PHYC 201 (calculus-based physics).
- Computer Science (AS-T) — requires PHYC 201 (some transfer pathways).
- Kinesiology (AS-T) — usually requires PHYC 130 (Introductory Physics for Life Sciences).

4. Education / Teacher Preparation

- Elementary Teacher Education (AS-T, CSU + IGETC) — includes PHYC 110 or PHYC 130 as GE requirements.

Trends: Most awards are in the AS-T pathways, though totals have declined slightly as students transfer without completing an associate degree. The local AS remains small because UC transfer does not require a degree, only ASSIST coursework. Many students finish our sequences and transfer in STEM, but do not appear in degree counts.
Transfer context: Cuyamaca data show that most physics students transfer into engineering and the life sciences, rather than physics. Our enrollments, such as the doubling of PHYC 201/202 between 2022 and 2024, demonstrate that Physics and Astronomy serve as a gateway for all

STEM transfers. GE offerings (Physics 110, Astronomy) also serve hundreds of non-STEM students, advancing science literacy and transfer credit.



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).

- **AS in Physics (Local):** Last full review Fall 2015.
- **AS-T in Physics (TMC 1.0):** Active through 2025–26 catalog; must transition to **Physics 2.0 AD-T** in 2026–27.
- **Astronomy:** No degree/certificate, GE-only.

Can students complete the degree/certificate requirements within a two-year period?
No

If you answered "No" above, please explain.

Sort of yes and no, students can complete the AS and AS-T in Physics within two years, but only if they begin taking Calculus I (MATH 180) their first semester and follow the program maps precisely. Both degrees require completing the full calculus sequence (MATH 180/280/281) and the three-course physics sequence (PHYC 201/202/203).

Comprehensive Program Review

For the local AS in Physics, which requires CHEM 141 and 142, students who also need CHEM 120 (pre-Chemistry) as a prerequisite will not complete the sequence in two years unless they begin the chemistry sequence in the summer before their first fall semester, which they usually find out in fall, when it's already too late.
In practice, many of our students take three or more years before transfer due to prerequisite issues, chemistry requirements, GE, and balancing heavy STEM course loads with work and home obligations. Transfer data show that physics and engineering students at Cuyamaca often take 4-5 years to complete a "two-year" program. The upcoming Physics 2.0 AD-T, which adds Differential Equations, Linear Algebra, and Computer Science to our existing 1.0 AD-T, will make two year completion much more challenging.

How is your program currently assessing its PLOs? Please select all that apply.
SLO-to-PLO Mapping
Direct assessment (e.g., capstone course project)
Shared PLO assessment across the ACP

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.
In Fall 2023, we assessed both Physics PLOs in PHYC 203. While the majority of students passed the assessments at or near mastery, the evaluation process itself revealed important gaps. Specifically, students demonstrated content mastery but struggled with the higher-level skills embedded in PLO 1 (drawing scientific conclusions from complex systems) and PLO 2 (communicating technical ideas in professional settings). Many felt overwhelmed by being asked to complete a large, independent final project without sufficient prior scaffolding in experimental design, critical thinking, and communication.
These findings prompted a redesign of the PHYC 203 lab sequence. Earlier labs were restructured to progressively build skills in experimental design, data analysis, and professional communication. The capstone was shifted from a single large final report into a mini-conference format, giving students multiple opportunities to present their work in both written and oral formats. This redesign ensures that students develop the necessary skills step by step, rather than being thrown directly into a single high-stakes assignment.

Are all of your degree maps completed?
Yes

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?
All three Physics degree maps (AS, AS-T CSU Breadth, AS-T IGETC) were completed in 2023 but have not yet been published. These maps now need to be reviewed for alignment with **CalGETC and recent GE changes** before posting to the catalog and website. The new **Physics 2.0 ADT** map is still planned and must be developed for the 2026–27 catalog. Astronomy has no degree map, as it serves GE only. https://docs.google.com/spreadsheets/d/1N_uWfd_yE64sm0mVlkwFbdoVMJ_Cf3x2RjJwHVTGN3o/edit?usp=sharing

How are you currently assessing your PLOs? If you are not currently assessing PLOs, what is your plan to assess PLOs in the future?
This ties assessment directly to the capstone course (PHYC 203), where majors demonstrate their highest-level skills, and provides a clear rubric-based framework for reporting.
PLO 1 – Draw scientific conclusions about simple and complex systems by collecting, assessing, and analyzing information.

- **Assessment Tool**: Student-designed laboratory experiments in PHYC 203.

Comprehensive Program Review

- **Method**: Evaluate students' lab reports and data analysis for their ability to design experiments, interpret results, and draw valid conclusions.
- **Scoring**:
  - *Below Mastery*: Demonstrates incomplete or incorrect data collection/analysis; conclusions not supported by evidence.
  - *Near Mastery*: Collects and analyzes data with some errors; conclusions partially supported but may lack depth.
  - *Mastery*: Collects and analyzes data accurately; conclusions are logical, evidence-based, and clearly articulated.

PLO 2 – Communicate technical ideas in group and professional settings in both written and oral form.

- **Assessment Tool**: Final project (written + oral presentation) in PHYC 203.
- **Method**: Evaluate students' ability to present technical content clearly and professionally to peers and instructors.
- **Scoring**:
  - *Below Mastery*: Communication is unclear, incomplete, or lacks professional organization.
  - *Near Mastery*: Communicates ideas with adequate clarity but may have gaps in organization, precision, or audience engagement.
  - *Mastery*: Communicates ideas with clarity, precision, and professional presentation, both in written and oral formats.

Cycle & Reporting: Both PLOs will be assessed on a **4-year cycle**, beginning with PHYC 203 capstone assignments. Aggregated results (percent of students at each performance level) will determine overall PLO achievement.

How are your PLO assessments informing improvements/changes to your program?
PLO assessments are central to how the Physics program identifies and addresses student learning needs. Even when most students meet or exceed benchmarks, the **assessment process itself provides valuable insights** into where students struggle and where instruction can improve. In Fall 2023, the data showed high pass rates, but faculty observations during evaluation highlighted that students needed more structured preparation to thrive in complex, open-ended projects.
This is how PLO assessments guide our continuous improvement cycle: they highlight not just whether students can pass, but how effectively they are developing the underlying skills. These insights inform **course redesigns, scaffolded assignments, and pedagogical changes** to strengthen preparation. PLO results also justify **resource requests** (e.g., embedded tutors, lab support, smaller caps) and equity interventions for students who need additional support.
By treating PLO assessment as both a **measurement and a reflective process**, we ensure that program changes are data-driven, responsive to real student experiences, and aligned with transfer and workforce expectations.

Student Access and Achievement

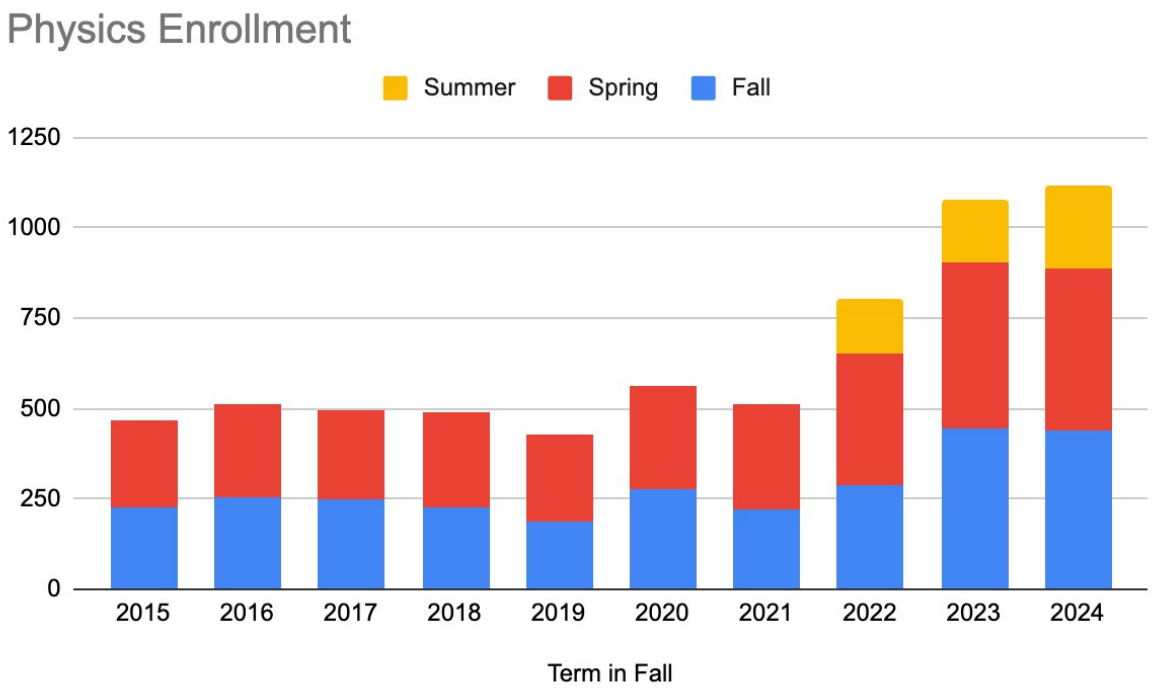
Please describe any enrollment changes (increases/decreases) over the past 4 years and the context for these changes.

Enrollment changes (past 4 years) and context.

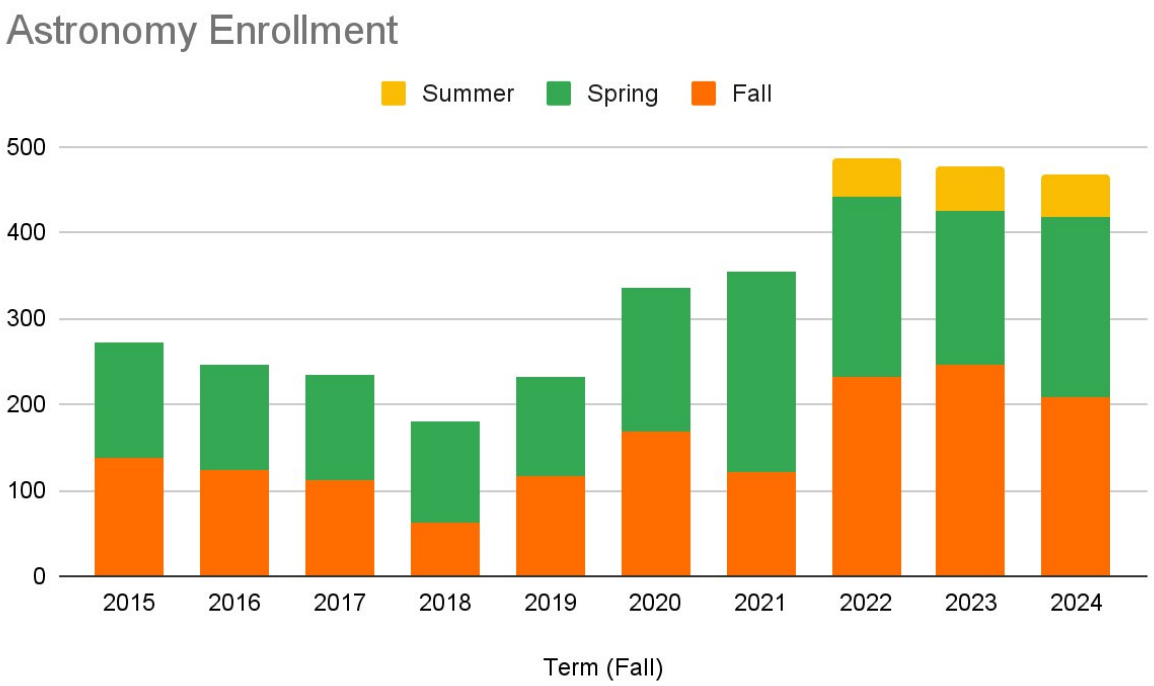
- **Overall**: Consistently 900 → 1,600 (+75%)

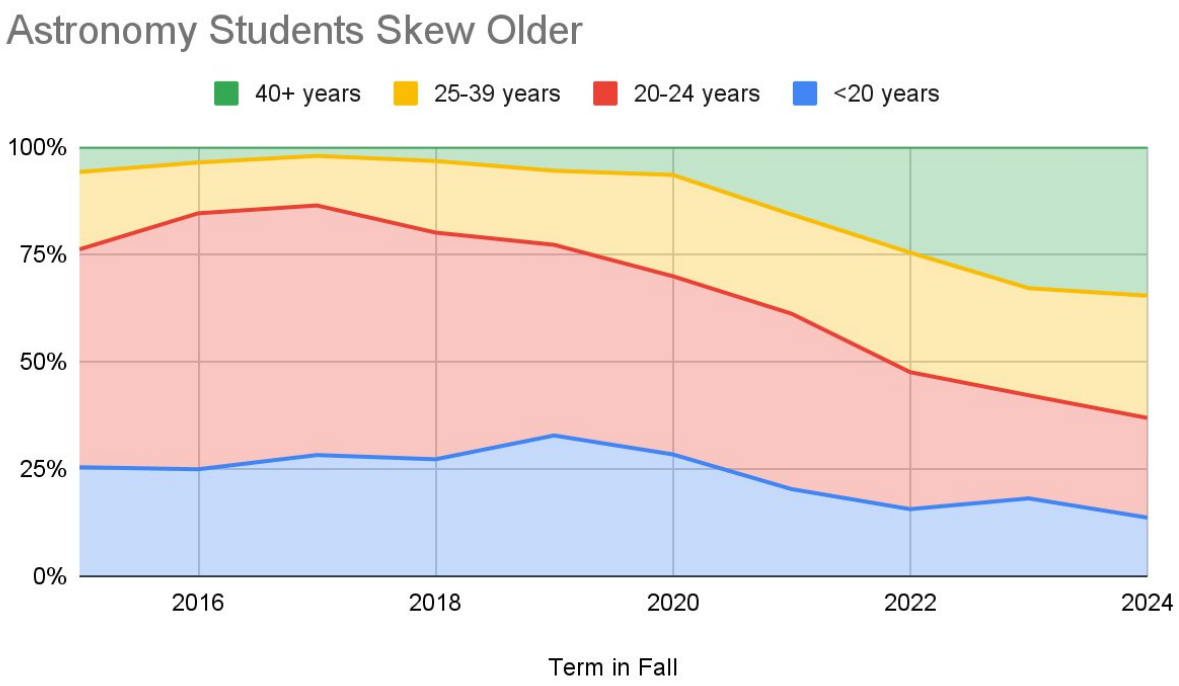
Comprehensive Program Review

- Physics: This growth has been sustained through faculty innovation (over 75% EMTLI-trained, 60–80% active in SEED, five campus teaching awards), flexible modalities, and affordability through ZTC adoption across nearly all courses.
    - Summer boost: Started offering summer courses in 2023 (164) → 226 by 2025.
    - **PHYC 110 (GE, ZTC)**: Relaunched 2022; ~70/term.
    - **PHYC 130/131 (Life Sci)**: Growth 2018–22; PHYC 131 peak 151 (Spring 2021, 91% success); now steady ~140–150/yr; POCR-certified, Exchange-ready. Boost from STEM grant redesign for life science majors (more biology centered, particularly new labs, project based), excellent online and in-person instruction, strategic use of strong embedded tutoring model.
    - **PHYC 201/202/203** *(renumbered from 190/200/210 to align with Grossmont)*: Drove 2022–25 gains; each now ~250–270/yr; Gains from strong second-semester persistence, redesigned labs (more project based, student centered, and inquiry oriented), flexible modalities (HyFlex, hybrid, and asynchronous DE used strategically), and affordability through full ZTC adoption.



- **Astronomy**: Holding steady at 450–500/yr (almost double); online widened access (55–60% age 25+, 51–65% women). Online delivery offsets the lack of a permanent observatory space, poor storage, and dated rooms, issues that historically suppressed on-campus demand. Primary audience: older/working learners requiring transfer GE or salary advancement credit.


Astronomy Enrollment
Summer
Spring
Fall
500
400
300
200
100
0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Term (Fall)



Contingency plan for declining enrollments: Expand Exchange-listed sections, adjust the modality mix (HyFlex ↔ DE), and run targeted re-recruitment campaigns with STEM partners.

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?
n/a

What is the program doing to increase student enrollment or access?
Highlights:

- **Flexible modalities:** DE↔HyFlex↔in-person to meet demand and bring labs back on campus without losing online volume.
- **Affordability: ZTC** available across PHYC 201–203 & PHYC 110; low-cost options are also available elsewhere.
- **Quality signals: POCR** for PHYC 130/131; **CVC Exchange** pipeline for statewide draw.
- **Calendar capacity:** Added **summer Physics**; steady **~50 ASTR** each summer.
- **Faculty excellence:** >75% **EMTLI**, 60–80% **SEED** participation, **5 teaching/outstanding faculty awards** in 5 years.

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The Physics & Astronomy program has increased enrollment by over 75% in the past four years through intentional strategies that enhance both access and capacity. Key efforts include:

- **Flexible Modalities**: We rapidly expanded online options during the pandemic to preserve access, and then strategically rebuilt in-person labs and lectures by utilizing hybrid and HyFlex. This has enabled us to bring students back to campus without compromising online enrollment, providing students with genuine choice and flexibility.
- **Zero-Textbook-Cost (ZTC) Courses:** We now offer the entire PHYC 201/202/203 calculus-based sequence and PHYC 110 fully ZTC, eliminating textbook costs as a barrier and making physics more affordable for all students.
- **POCR Certification & CVC Exchange:** PHYC 130 and 131 (life science physics) are POCR-certified, ensuring high-quality online delivery and positioning them to draw students statewide once they launch on the California Virtual Campus Exchange.
- **Summer Expansion:** We added summer physics (2023 onward) and astronomy offerings (~50 students per summer), opening new pathways for students to accelerate transfer preparation.
- **Targeted Access for Older & Nontraditional Students:** Astronomy's pivot to fully online delivery created access for older adults and working professionals who cannot easily come to campus but need GE transfer science credit or salary advancement credit. This has expanded the program's reach beyond traditional transfer students.
- **Faculty Excellence & Training:** Over 75% of faculty have completed EMTLI, and 60–80% regularly participate in SEED. Faculty have earned five campus awards for teaching or outstanding faculty in the last five years. This commitment to equity-minded, high-quality instruction directly supports enrollment growth and student success. We are very strategic in hiring, onboarding, and training to maintain this culture of high-quality, culturally proficient classroom practice.

Regional and Statewide Draw: Our flexible formats, high-quality instruction, and reputation have begun to attract students from Southwestern College and other institutions across the state, broadening access beyond our local service area. We also took a lot of Grossmont's enrollment (oops), but we gained more than they lost (as a district, we are still up ~100 students a year since 2021).

What is your program's overall course success rate? How has it changed over the past 4-5 years?
Summary: Retention 90–95%; success 80–90% overall (Physics & Astronomy), above college (mid-70s) and district (high-60s/low-70s) *(per 2020–25 program review data)*.
Gateway highlights: Typically the worst performing classes in Physics with most colleges averaging 50-70% success rates and consistently offering less sections of the second semester class.

- **PHYC 130 (Life Sci I):** 75% avg fall success; peaks >90% in some terms with large cohorts.
- **PHYC 201 (Mechanics):** 85% fall avg, 80% spring avg, highs to 89%.

Physics & Astronomy at Cuyamaca have significantly expanded both access and success, outpacing institutional and districtwide averages. Enrollment is larger and more diverse than a decade ago, persistence into second-semester physics is unusually strong, and success rates in PHYC 130 and 201 place the program among the strongest in the region. Through equity-minded teaching, ZTC affordability, flexible modalities, and systemic changes to prerequisites, the program has built a record of broad access and high achievement.

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Success and Retention: Over the last several years, Physics and Astronomy have achieved high retention rates (approximately 90–95%) and strong course success (generally 80–90%), including in gateway courses. PHYC 130 has averaged ~75% success in recent fall terms, while PHYC 201 averages ~85% in fall and ~80% in spring. Astronomy courses, which now enroll ~500 students annually (including around 49 each summer), consistently achieve success rates of 80–90%. These outcomes are well above institutional and districtwide benchmarks: Cuyamaca's overall course success rates have been in the mid-70s (74–75% from 2020–23, reaching 77% in 2023–24), while districtwide rates typically range from the high-60s to the low-70s.

Demographics and Access: Access has also broadened significantly. In physics, redesigned math pathways lowered barriers for entry, allowing students to take calculus-based physics earlier in their college careers. This has expanded Hispanic/Latino participation, and representation of women has grown compared to a decade ago. In astronomy, the shift to high-quality online offerings has dramatically changed student demographics: today, over 55–60% of astronomy students are 25 years or older, compared to far fewer before, and women make up a majority (51–65%). These online formats have been particularly successful in reaching older adults and working professionals seeking credits for career advancement—students who previously avoided astronomy due to limited campus facilities.

High Success in Entry-Level Physics: Cuyamaca's Physics program stands out regionally for its strong outcomes in the first semester of each sequence. In PHYC 130 (Life Science Physics I), success rates have averaged about 75% over the past five years, with peak semesters reaching over 90% even with large enrollments. In PHYC 201 (Mechanics), success rates have averaged 80–85%, with some terms reaching as high as 89%. These results are significantly stronger than the mid-60s to low-70s averages often reported for introductory physics courses at other California community colleges. Equally important, enrollment has more than doubled since 2020–21, and unlike many colleges that see steep attrition, Cuyamaca maintains robust second-semester enrollments in PHYC 131 (Life Science Physics II) and PHYC 202 (Electricity & Magnetism). This combination of high success and unusually strong persistence across sequences highlights both the accessibility and overall health of the program.

Which groups are experiencing equity gaps in your program for success rate and/or retention rate?
Gaps persist for **Black** students (Physics & ASTR) and, in some terms, for **Hispanic/Latino** students (Physics), typically **10–15 pts** below White/MENA peers in those terms *(per 2020–25 program review data)*.
Progress: Compared to 2016–20 (Hispanic/Latino **80–86%** vs. White **~92%**), in 2021–25 Hispanic/Latino now **retain ~90% and succeed 78–80%**, closing many term-level gaps; ASTR overall success **~80–90%** while expanding access to women and older adults *(per 2016–20 vs. 2021–25 tables)*.
Equity gaps remain a challenge, particularly for African-American/Black students in both Physics and Astronomy, and for Hispanic/Latino students in some terms, where success rates trail White and Middle Eastern/North African peers by 10–15 percentage points. These patterns are not unique to Cuyamaca, national data show that physics and astronomy have some of the largest racial equity gaps in STEM, with Black and Latino students underrepresented in enrollment and degree attainment, and with lower average course success and persistence compared to White and Asian peers (AIP Statistical Research Center, 2023).
Yet compared to these broader patterns, Cuyamaca has made notable progress over the last decade. From 2016 to 2020, Hispanic/Latino students in physics consistently faced equity gaps in both retention and success, with an average success rate of around 80–86%, compared to 92% for White students. In the most recent five-year period (2021–2025), however, Hispanic/Latino physics students achieved retention rates of nearly 90% and success rates of 78–80%, closing gaps in many terms and outperforming district averages. Similarly, Astronomy success has held near 80% overall, well above typical community college GE averages of 65–70%, even while broadening access to older adults and women.
These improvements reflect systematic changes: accelerated math pathways have lowered barriers to entry, Zero-Textbook-Cost (ZTC) adoption has reduced financial hurdles, and faculty participation in EMTLI and SEED has embedded equity-minded practices into instruction. The

persistence of gaps for Black students, however, highlights the need for more comprehensive structural supports, proactive interventions, and community-building efforts to ensure that gains in access translate into equitable outcomes across all student groups.

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

- **Math gating** (improved via acceleration) → earlier entry into Physics sequences.
- **Work/financial pressures** → **ZTC**, flexible scheduling, embedded tutoring.
  Belonging/representation → equity-minded pedagogy via **EMTLI/SEED**, UDL practices.
- **Multi-term sequencing** → predictable rotations, summer offerings, proactive persistence supports.
- **Online equity gaps** → thoughtful DE design, HyFlex labs, targeted outreach.
- **Basic needs** → pantry referrals, early alerts, flexible policies.

Details:
Cuyamaca's Physics & Astronomy programs have turned many of the most common barriers in STEM (math prerequisites, cost, sequencing attrition, modality inequities) into areas of comparative strength. Hispanic/Latino students are no longer underrepresented, persistence into second-semester physics remains unusually strong, and women make up over half of astronomy enrollments. Equity gaps remain most visible for Black students, but the department's proactive strategies, math acceleration, ZTC, equity-minded pedagogy, flexible modalities, and basic needs supports are already producing measurable improvements and positioning the program as a leader in equitable access and success in the physical sciences.
The Physics & Astronomy programs have identified and worked to mitigate several long-standing barriers that impact success in STEM nationwide. While equity gaps remain, Cuyamaca's outcomes show clear progress compared to both our own historical baselines and statewide/national norms.

1. Structural Barriers in Preparation
Physics's high math prerequisites historically limited access for students from under-resourced K–12 schools or those placed into remedial math. Over the past decade, math acceleration reforms at Cuyamaca have shortened the pathway to calculus, allowing students to enroll in physics sooner. As a result, Hispanic/Latino participation in PHYC 201 has increased substantially, and retention for this group now averages ~90%. Gaps remain in some terms, but overall access is far stronger than it was a decade ago.

2. Disproportionate Financial and Work Pressures
Many students enroll part-time while working or caring for their families. To address these pressures, the department has moved aggressively to adopt Zero-Textbook-Cost (ZTC) courses across nearly all physics and astronomy offerings, reducing upfront expenses by hundreds of dollars. In addition, the use of HyFlex and online sections allows students with complex schedules to persist. These efforts contributed to overall success rates remaining above 80% even during the pandemic, when financial stress was at its peak.

3. Limited Representation and Belonging
Nationally, physics and astronomy have among the lowest diversity in STEM, with only ~4% of bachelor's degrees in physics earned by Black students and ~12% by Latino students (AIP, 2022). At Cuyamaca, Black students remain a small cohort (<20 per year), but the department has invested in faculty equity training (SEED, EMTLI, Universal Design for Learning) to build inclusive classrooms and foster belonging. Over 75% of faculty have completed EMTLI, and more than half regularly participate in SEED. This training, along with active learning labs and embedded tutoring, has helped sustain retention above 90% for nearly all groups, even where success gaps persist.

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4. Course Sequencing Challenges

Multi-semester physics sequences often see steep attrition after the first term at other colleges. At Cuyamaca, persistence is a distinctive strength. Enrollment in second-semester courses (PHYC 131 and PHYC 202) remains robust, with 60–100 students per term, well above regional norms. This reflects intentional scheduling (predictable rotations, summer offerings) and student supports (active lab communities, tutoring). While gateway success gaps in PHYC 130 and 201 magnify equity issues, students who complete the first course overwhelmingly stay and succeed in later courses, a major improvement compared to statewide patterns.

5. Technology and Modality Barriers

Equity gaps are common in online STEM nationally (CCCO, 2023), but Cuyamaca has leveraged modality flexibly to maximize access. Astronomy's pivot to high-quality online design attracted hundreds of new students, including working adults and those 25+ seeking salary advancement credits, without reducing overall success (which remains ~80–90%). In physics, HyFlex has allowed students to return to on-campus labs while retaining the flexibility of remote access. While online equity gaps persist, success rates for Hispanic students in astronomy have improved compared to pre-pandemic face-to-face offerings, demonstrating that thoughtful online design can mitigate barriers.

6. Broader Socioeconomic Factors

Food insecurity, housing challenges, and mental health strain disproportionately affect marginalized students. The department has responded with proactive outreach (faculty using early alerts and Canvas messaging), connections to the Cuyamaca Food Pantry, and flexible grading and late work policies. These interventions helped keep withdrawal rates extremely low during COVID-19 and continue to support students.

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

Summary:

Data exposed gateway gaps → ***Adopt PER & education research*** *(active learning, belonging, transparency)* → ***Scale PD*** *(EMTLI >75%, SEED 60–80%)* → ***Redesign courses*** *(HyFlex labs, ZTC, embedded support)* → ***Schedule for persistence*** *(predictable rotation + summer)* → ***Monitor*** *via regular student surveys* → ***Results:*** *high success in* ***PHYC 130/201****, strong second-semester persistence, improved Hispanic/Latino outcomes.*

Details:

Over the past decade, data on equity gaps have not only shaped but fundamentally transformed how Physics & Astronomy at Cuyamaca operates. Early program reviews consistently revealed gaps for African-American/Black and Hispanic/Latino students, especially in gateway courses (the first semester of each physics sequence). Success rates for Hispanic/Latino students in physics, for example, averaged 80–86% from 2016–2020, compared to 92% for White students, creating persistent equity gaps. We saw that if students did not succeed in these entry points, they were unlikely to persist into second- and third-semester courses, magnifying the impact of inequities right at the start. This realization shifted our focus toward redesigning these courses to be more inclusive, better supported, and better aligned with student needs.

At the same time, math acceleration reforms reshaped the playing field. In the past, long prerequisite chains in math kept many students, especially from underrepresented groups, out of physics entirely. Once the prerequisite sequence was shortened, the impact was immediate: Hispanic/Latino retention in physics rose to ~90% between 2021–2025, with success rates stabilizing at 78–80%, closing gaps in many terms and even outperforming district averages. We also saw more women and younger students entering physics earlier in their college careers. These shifts confirmed that structural reforms could expand access, and they pushed us to think carefully about how to amplify those gains by focusing on persistence and success.

In response, the department deliberately embraced research-driven innovation:

- **Physics & Education Research as Guides:** We looked to physics education research, which emphasized active learning, community-building, and equity-minded pedagogy, and to general education research, which highlighted belonging, affordability, and transparency as critical to student success.

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- **Faculty Development – EMTLI and SEED:** These insights shaped our push for faculty development. Over 75% of faculty have completed EMTLI, embedding inclusive, research-based practices into instruction. We also created SEED, a departmental community of practice rooted in educational research and Scott's experiences at High Tech High, where faculty experiment, share data, and learn together.
- **Democratic Governance and Growth Culture:** Hiring, training, and evaluation prioritize equity-minded faculty who put students first. We provide high-quality, shared instructional materials, organized Canvas shells, and strong staff support so instructors can focus on students. Evaluation and mentoring are designed for growth, not gatekeeping.
- **Student-Centered Adaptation:** We regularly survey students to identify needs, and their feedback has led to innovations such as HyFlex labs, consistent Zero-Textbook-Cost (ZTC) adoption, and embedded tutoring. These supports have helped keep physics retention consistently 90–95% and success 80–90% even during periods of rapid enrollment growth.

Culture of Innovation: EMTLI, SEED, and our democratic ethos have created a culture where innovation is expected. This approach has had lasting impact: in PHYC 130 (Life Science Physics I), success rates now average ~75%, with peak semesters exceeding 90% even with large enrollments. In PHYC 201 (Mechanics), success averages 80–85%, with highs of 89%, far above the 65–70% averages reported for introductory physics statewide. Importantly, Cuyamaca sustains unusually strong persistence into second-semester courses (PHYC 131, PHYC 202), with 60–100 students per term—where many colleges see steep drop-offs.

Discuss your department/discipline's plan for diversifying department faculty in alignment with the GCCCD Board Resolution 20-015.
The Physics & Astronomy department is committed to advancing faculty diversity in alignment with GCCCD Board Resolution 20-015. We recognize that representation and inclusive pedagogy are essential to student belonging, persistence, and equity in STEM. Our approach has two complementary goals: (1) broaden and diversify our faculty hiring pipeline, and (2) strengthen equity-minded practices among current faculty.

- **Broadening the Hiring Pool:** We actively advertise adjunct openings beyond traditional networks, reaching out through discipline-specific listservs, affinity groups, and regional professional organizations to reach candidates who might not otherwise see our postings. This helps ensure a broader and more diverse applicant pool, counteracting the narrow, homogenous networks common in STEM hiring.
- **Equity-Minded Hiring:** In recruitment and interviews, we emphasize equity-minded teaching, cultural competency, and strengths-based approaches as core expectations. We seek faculty who not only possess disciplinary expertise but also demonstrate a willingness to learn, adapt, and prioritize student success.
- **Onboarding and Mentorship:** Once hired, new faculty receive high-quality shared instructional resources (including ZTC materials and pre-built Canvas shells), mentoring from experienced colleagues, and integration into our democratic departmental governance model. This ensures they are supported in focusing their energy on students rather than building everything from scratch.
- **Ongoing Training for Current Faculty:** All faculty are encouraged to deepen their practice in strengths-based pedagogy (focusing on what students bring rather than deficits) and cultural proficiency (teaching with awareness of and responsiveness to diverse student backgrounds). Over 75% of our instructors have completed EMTLI, and more than half regularly participate in SEED, where strengths-based and equity-minded pedagogy are key themes. These professional learning communities offer safe spaces for experimentation, reflection, and adapting instruction to meet students' needs.

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- **Community of Practice:** Through SEED and regular department collaboration, we sustain a culture of shared growth and innovation. New and seasoned faculty alike are expected to continually refine their pedagogy, ensuring that diversity and equity are not only hiring goals but embedded in everyday classroom practice.

Through these combined efforts, the department is building a faculty body that is both more diverse and more culturally responsive—ensuring that students in Physics & Astronomy encounter role models and instructors who reflect their experiences, support their strengths, and provide an inclusive learning environment.

What other qualitative or quantitative data, if any, is the department/discipline using to inform its planning for this comprehensive program review?
Beyond official program review data, the Physics & Astronomy department integrates multiple sources of qualitative and quantitative information into its planning. Together, these qualitative and quantitative data sources ensure that departmental planning is not only grounded in official metrics but also responsive to student voice, regional context, and evolving statewide trends:

- **Student Surveys & Feedback:**
    - We regularly survey students in physics and astronomy to gather input on course design, modality preferences, support needs, and barriers to success.
    - Surveys have informed major changes such as adopting HyFlex labs, expanding Zero-Textbook-Cost (ZTC) offerings, and embedding tutoring support.
    - Feedback loops allow us to adapt quickly—for example, shifting lab structures during COVID or redesigning Canvas shells for greater clarity.
- **Student Comments and Complaints:**
    - Informal channels, including direct feedback to instructors and comments collected through course evaluations, provide ongoing insight into areas needing attention.
    - Concerns about affordability, modality access, and lab scheduling have directly shaped program priorities in recent years.
- **External Benchmarking (Other Colleges):**
    - We track practices and enrollments at other community colleges in the region. For instance, most colleges have discontinued or never offered fully online physics labs, whereas Cuyamaca continues to be one of the few institutions offering this modality.
    - This unique offering has allowed us to sustain enrollment and broaden access, particularly for students outside our immediate service area or those balancing work and family obligations.
- **Faculty Professional Development & Peer Networks:**

- Participation in SEED, EMTLI, and state-level discussions (e.g., CVC Exchange, POCR) provides broader insight into trends and innovations in STEM education.
- These connections help us anticipate changes in student demand and align our planning with statewide equity and access initiatives.

Distance Education Course Success (If Applicable)

If your department offers distance education classes, how do you ensure Regular and Substantive Interaction (RSI) is being implemented?
RSI is ensured through a combination of *monitoring (analytics, peer review)* and *deliberate design* (discussion, synchronous sessions, interactive assignments, embedded support). These practices ensure that online and HyFlex students have consistent, meaningful academic interaction with faculty beyond just content delivery
Evaluation-based approaches

- **Canvas Analytics & Reports** are used to monitor student engagement, discussion participation, and interactions with course materials.
- **Peer reviews and observations** allow faculty to check one another's online courses for frequency and quality of instructor-student interactions.

Faculty best practices

- **Active discussion boards** (Canvas or Discord): Instructors pose inquiry-based prompts and engage directly in discussions to keep communication two-way and academically focused.
- **Live sessions and office hours**: Regular synchronous options (Zoom, Canvas, Discord) provide students with direct access to their instructor for questions and feedback.
- **Interactive assignments with feedback**: Problem-solving projects and inquiry-based tasks are paired with detailed instructor feedback.
- **Embedded support**: Learning assistants or teaching assistants join courses to provide additional academic interaction and engagement points.

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?
Across modalities, retention remains consistently strong (≈90–95%), but success rates vary. In-person and HyFlex courses are the strongest performers, with success typically in the 85–93% range and minimal gender gaps. **HyFlex in particular has proven especially effective**: the combination of in-person, synchronous online, and asynchronous access offers students a sense of security, flexibility, and accessibility that allows them to remain engaged even when work, family, or transportation challenges arise. Students can choose how to participate on a week-by-week basis, and this adaptability appears to support persistence and strong performance across groups.
Fully online courses retain well but show the widest equity gaps, especially in GE courses like Astronomy and Physics 110, where Hispanic and African American students often succeed at rates 10–20% below Asian and White peers (e.g., Physics 110: Hispanic 74.5% vs White 82.5%). Hybrid courses perform better than online courses but worse than traditional in-person courses, with condensed formats (14 weeks) showing lower success rates.

By demographics, **younger students (<24) are the most successful (75–92%)**, while older students are more variable and often lower in online settings. **Gender gaps are small**, with women sometimes outperforming men (e.g., Astronomy online: females, ~75–80% vs. males, ~68–73%). The largest and most persistent gaps are **by race/ethnicity**, where Hispanic and African American students underperform in both GE and majors courses, though majors courses (PHYC 201–203) overall have higher success (80–90%) and narrower gaps than GE.

Aside on Asynchronous DE Challenges and Responsibilities

While asynchronous online courses provide flexibility, they have presented persistent challenges. We have encountered **articulation issues with the UC system**, which increasingly favors in-person formats. The rise of **AI has complicated authentication and academic integrity**, requiring substantial course redesign. Both **faculty and students report burnout** with the format, citing the difficulty of building real connections online, and many have intentionally returned to in-person despite less convenient schedules. We are also seeing troubling cases—at both Cuyamaca and Grossmont—of **faculty disengagement in asynchronous courses**, where previously reliable instructors disappear for unacceptable stretches of time.

At the same time, we recognize that for many students, the choice is not *between online and in-person*, but rather *between online and nothing at all*. Online offerings remain critical for students balancing work, caregiving, and other barriers to in-person attendance. Because of this, we are **scaling back our online offerings strategically**, ensuring they are led only by faculty we deeply trust to manage the rigor, workload, and integrity required. Importantly, **GCCCD is the last community college district in California to offer calculus-based physics for scientists and engineers fully online**, and we take this responsibility seriously. Our goal is to preserve access while protecting students' transfer success and ensuring that our online programs meet the highest academic and professional standards.

We also strongly believe that in order to succeed online, **course caps should be smaller than those in in-person sections,** and/or faculty should be provided with **embedded tutors and TAs for support**, particularly in the case of online labs. Without this support, the burden on faculty becomes unsustainable, and students are less likely to get the authentic, interactive learning experience they need to succeed and our equity gaps will continue.

Attach Related Documents - Distance Education Course Success

ASTRO_ONLINE.pdf;
Gen Ed Phys Sci_Ret Succ_Race Gen Age.pdf;
PHYS_HF.pdf;
PHYS_ONLINE_14 WEEKS.pdf;
PHYS_ONLINE_16 WEEKS.pdf;
PHYS_ONLINE.pdf

Career Exploration and Program Demand (Career Education Programs Only)

Is your program a career education program (e.g., does it prepare students to directly enter the workforce)?

No (Skip to the question at the end of this section starting with "What do the latest labor market data reveal ...")

What do the latest labor market data reveal about the careers (including those for transfer students) for which your program prepares students?

The local labor market strongly favors students who begin in Physics & Astronomy and then transfer into engineering, computing, and applied physics pathways. Median pay in those fields is well above San Diego's living-wage threshold, and employer demand is deep and persistent. This supports our enrollments and underscores our role in preparing students for stable, living-wage careers.

Regional Labor Market Highlights

- **Engineering**: ~17,180 jobs in San Diego in 2023; median wage ~$135,745; ~450 job postings/month. Skills most in demand include electrical/mechanical/systems engineering, MATLAB, Python, and CAD. Major employers include General Atomics, Northrop Grumman, Qualcomm, Apple, and L3Harris.[1]
- **Computing**: ~37,306 jobs; median wage ~$136,458; ~1,309 postings/month; ~3,028 average annual openings. Top skills include CS fundamentals, Python, software engineering, and Agile. Top employers include Apple, Qualcomm, BAE Systems, and Booz Allen.[2]
- **Physics & Astronomy (direct occupations)**: ~501 jobs; median wage ~$140,076; ~8 postings/month; ~48 annual openings. Jobs concentrate in research, federal agencies, and healthcare (e.g., medical physicist, radiation physicist, radiation engineer).[3]
- **Completions vs. openings**: Regional physics-related completions in 2023 totaled ~325 (including 24 from Cuyamaca). Annual openings for physics-specific roles were ~48. This mismatch illustrates that most physics graduates transition into engineering, computing, and health roles with thousands of annual openings.[3]
- **National outlook**: The U.S. Bureau of Labor Statistics projects ~4% growth for physicists and astronomers from 2024–2034 (about average), with most openings due to retirements and replacements.?
- **Living wage context**: MIT's 2025 Living Wage Calculator for San Diego shows that typical physics/engineering/CS salaries ($135k–$140k+) are well above the regional living-wage threshold.?

Implications for Students and Our Role

1. **Enrollment tailwind**
   Local demand in engineering, CS, and applied physics suggests sustained or increasing interest in PHYC/ASTR courses, particularly the calculus-based sequence.
2. **Clear living-wage pathways**
   Graduates entering engineering, computing, or medical physics careers earn well above local living-wage thresholds.
3. **Health/medical physics niche**
   A durable local pathway combines physics + math + programming with clinical applications (e.g., UCSD and Sharp healthcare systems).
4. **Skills alignment**
   Employer demand for Python, MATLAB, data analysis, CAD, and systems engineering matches curricular updates we've begun embedding in PHYC 201–203.
5. **Student advising transparency**
   While physics-specific openings are modest, physics training is highly portable. Students should be advised early about the broader engineering and computing markets.

Recommended Actions

- Market wage/demand outcomes directly in orientations and schedules.
- Deepen programming and data analysis integration in physics labs.
- Expand employer-visible deliverables (GitHub projects, CAD artifacts).
- Work on a “health/medical physics” part of the Health and STEM ACPs.

References

1. Lightcast, *Engineering Occupations in San Diego–Chula Vista–Carlsbad MSA*, 2023–2024 labor market data.
2. Lightcast, *Computer & Mathematical Occupations in San Diego–Chula Vista–Carlsbad MSA*, 2023–2024 labor market data.
3. Lightcast, *Physics & Astronomy Occupations in San Diego–Chula Vista–Carlsbad MSA*, 2023–2024 labor market data
4. U.S. Bureau of Labor Statistics, *Occupational Outlook Handbook: Physicists and Astronomers*, 2024–2034 projections.
5. MIT Living Wage Calculator, San Diego County, 2025 update.

Strengths, Challenges & External Influences

Please describe your program's strengths.

Strengths

- **Innovation**: We have redesigned labs, implemented HyFlex teaching with embedded TAs, and piloted a mini-conference model for student projects. These innovations have improved both learning outcomes and student engagement.
- **Teaching Excellence**: Faculty are consistently engaged in professional development (EMTLI, SEED, humanizing STEM) and are committed to equity-minded, student-centered pedagogy. This has supported consistently high retention (≈90–95%) and strong success (80–90%) across modalities.
- **ZTC Grant**: We have leveraged Zero Textbook Cost funding to fully convert PHYC 110 and 201 into ZTC courses, with 202 and 203 in progress. This reduces financial barriers and expands equitable access.

Collaboration with Grossmont: We have a good working relationship with Grossmont faculty, coordinating course rotations and curriculum alignment. This partnership helps ensure consistency for students who move between colleges.

Please describe your program's challenges.

Program challenges.

- **Chair Time**: Our enrollment has grown substantially, but chair release time has not kept pace. Compared to Grossmont and other colleges, our chair has disproportionately less time to manage a much larger program. This is unsustainable and directly affects our ability to plan, supervise, and innovate. Our chair time is 0.40 FTE. This includes surveying, earth science, engineering, physics and astronomy. Our

department has the 4th highest enrollment in the college, but ranks 14th in chair reassigned time. I know this is a union issue and they are aware, but this is actually killing us.

- **Space**: We are **out of lab space**, preventing us from adding new sections even when demand is strong. This bottleneck constrains growth and limits access for students.
- **Staffing**: With only one lab technician, we cannot even run **daytime labs reliably** due to lack of coverage. If our sole tech were unavailable, program operations would collapse.

Astronomy Facilities: Astronomy has **no adequate telescope space**. Unlike peer colleges that have observatories or designated dark-sky areas, we operate on a dirt patch with poor lighting control. We lack proper lab support, storage, and facilities. To run Astronomy in-person at the level students deserve, we need significant investment: a new classroom, upgraded telescope viewing space, and infrastructure to control outdoor lighting. Without this, Astronomy in-person labs remain unsustainable.

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

External influences (positive/negative).

- Other local colleges have very negative reviews from students in Physics. Counselors send students to us hopefully for being good, but at least for being not terrible.

Labor Market Data

The local labor market strongly favors students who begin in Physics & Astronomy and then transfer into engineering, computing, and applied physics pathways. Median pay in those fields is well above San Diego's living-wage threshold, and employer demand is deep and persistent. This supports our enrollments and underscores our role in preparing students for stable, living-wage careers.

Regional Labor Market Highlights

- **Engineering**: ~17,180 jobs in San Diego in 2023; median wage ~$135,745; ~450 job postings/month. Skills most in demand include electrical/mechanical/systems engineering, MATLAB, Python, and CAD. Major employers include General Atomics, Northrop Grumman, Qualcomm, Apple, and L3Harris.[1]
- **Computing**: ~37,306 jobs; median wage ~$136,458; ~1,309 postings/month; ~3,028 average annual openings. Top skills include CS fundamentals, Python, software engineering, and Agile. Top employers include Apple, Qualcomm, BAE Systems, and Booz Allen.[2]
- **Physics & Astronomy (direct occupations)**: ~501 jobs; median wage ~$140,076; ~8 postings/month; ~48 annual openings. Jobs concentrate in research, federal agencies, and healthcare (e.g., medical physicist, radiation physicist, radiation engineer).[3]
- **Completions vs. openings**: Regional physics-related completions in 2023 totaled ~325 (including 24 from Cuyamaca). Annual openings for physics-specific roles were ~48. This mismatch illustrates that most physics graduates transition into engineering, computing, and health roles with thousands of annual openings.[3]
- **National outlook**: The U.S. Bureau of Labor Statistics projects ~4% growth for physicists and astronomers from 2024–2034 (about average), with most openings due to retirements and replacements.?

Comprehensive Program Review

- **Living wage context**: MIT's 2025 Living Wage Calculator for San Diego shows that typical physics/engineering/CS salaries ($135k–$140k+) are well above the regional living-wage threshold.?

Implications for Students and Our Role

1. **Enrollment tailwind**
   Local demand in engineering, CS, and applied physics suggests sustained or increasing interest in PHYC/ASTR courses, particularly the calculus-based sequence.
2. **Clear living-wage pathways**
   Graduates entering engineering, computing, or medical physics careers earn well above local living-wage thresholds.
3. **Health/medical physics niche**
   A durable local pathway combines physics + math + programming with clinical applications (e.g., UCSD and Sharp healthcare systems).
4. **Skills alignment**
   Employer demand for Python, MATLAB, data analysis, CAD, and systems engineering matches curricular updates we've begun embedding in PHYC 201–203.
5. **Student advising transparency**
   While physics-specific openings are modest, physics training is highly portable. Students should be advised early about the broader engineering and computing markets.

Recommended Actions

- Market wage/demand outcomes directly in orientations and schedules.
- Deepen programming and data analysis integration in physics labs.
- Expand employer-visible deliverables (GitHub projects, CAD artifacts).
- Work on a "health/medical physics" part of the Health and STEM ACPs.

References

1. Lightcast, *Engineering Occupations in San Diego–Chula Vista–Carlsbad MSA*, 2023–2024 labor market data.
2. Lightcast, *Computer & Mathematical Occupations in San Diego–Chula Vista–Carlsbad MSA*, 2023–2024 labor market data.
3. Lightcast, *Physics & Astronomy Occupations in San Diego–Chula Vista–Carlsbad MSA*, 2023–2024 labor market data
4. U.S. Bureau of Labor Statistics, *Occupational Outlook Handbook: Physicists and Astronomers*, 2024–2034 projections.
5. MIT Living Wage Calculator, San Diego County, 2025 update.

Program Goals

Program Goals Status
Updated progress on my previous goals & added new.

Program Goals Mapping
Mapping for all active Program Goals complete.

Submission

Dean Approval and Feedback

I have reviewed the program review with the author and provided feedback.
Yes - Review and feedback complete

Feedback
- The program goals are a good reflection of the ongoing work in the department.
- The program's mission statement is a strong reflection of the values within the department, but also MSE and the college as a whole.
- The Physics and Astronomy program do an incredible job of upholding the college's vision, mission, and values. The focus on equity-minded and culturally responsive teaching has advanced the program in ways other similar programs across the region have not been able to do. This is one of the reasons for the continued growth in the departments.
- The Physics Department has done an incredible job updating the labs to ensure articulation agreements with several UCs can be official. The full- and part-time faculty worked well together to ensure this happened.
- The Physics and Astronomy Departments have done an incredible job working to incorporate equity-minded teaching and learning in their classes. The faculty participate in a lot of PD, including the Community of Practice the department co-hosts with Engineering.
- Physics is a true gateway for most STEM majors. The fact that the department recognizes this is why it has seen such incredible success.
- The PLO assessments that prompted a redesign in the PHYC 203 lab sequence is a model many programs across the college should see and think about how it can be incorporated.
- The achievement data the Physics and Astronomy classes have seen over the last 4-5 years is remarkable. As a result, the classes are a strong magnet to students across the region and the state. This is to be commended as the faculty have worked together to make this happen.
- The program overall truly embodies the college mission, vision, and values and has done incredible work in advancing the strategic plan. The department has a lot to be proud of with regards to professional development, research-based pedagogy to incorporate active learning, changing hiring practices, having an overall student-centered attitude towards everything they do.
- The two departments have done a great job reimagining the assessment of SLOs and what this truly means in a physics and astronomy course. The work done with the PLOs in physics has also been amazing based on their last full assessment. This is to be commended!