

Physics

Cover

Overview

Program Review Year**Title** Physics**Year of Last Comprehensive Review** Fall 2018**Year of Last Mini Update, if applicable****Originator** Batalha, Celso**Area Dean** Antoinette Herrera**Division**

Math, Sci. & Engineering

Department

Physics

Subject

- PHYS - Physics

Is this a review for a degree/certificate or all the courses in the subject?

Degree

- Physics, Associate in Science for Transfer - Active

Co-Contributors

*Co-Contributor must be chosen before proposal is launched

- Brown, Robert
- Fakhruddin, Fahmida
- Herrera, Antoinette
- Masuda, Michael

Overview

Evergreen Valley College guides all students to pathways that reach their educational and career goals through equity-centered, innovative academic programs and support services. By creating a learning environment where everyone feels welcomed and supported, we are committed to a culture of inquiry, growth, and respect that creates an equitable society in which all can participate and prosper.

1.Student-Centered: We provide access to quality and efficient programs and services to ensure student success.

- Access
- Curriculum and programs
- Services

2. Community Engagement: We will transform the college image and enhance partnerships with community, business and educational institutions.

Areas of focus are:

- Increase visibility
- Develop strategic partnerships
- Building campus community

3.Organizational Transformation: We create a trusting environment where everyone is valued and empowered.

Areas of focus are:

- Communication
- Employee development
- Transparent Infrastructure

- **1. Provide a brief summary of your program. Please include a brief history and discuss any factors that been important to the program's development.**

The Physics Program oversees several algebra-based and calculus-based general physics courses serving students en route to STEM. In addition, it has also developed a single descriptive course for non-science majors that includes all the general physics course content in an abridged format. All physics courses are offered with a lab counterpart, which is a requirement for transferability. The Associate for Transfer - Physics Program sprang out of the three calculus-based physics courses and has attracted relative attention from students, indicated by a sensible increase in graduations over the years.

Students do not come to our courses because they want to major in Physics. Community College students on a pathway to STEM take physics courses as a requirement for their majors in science, engineering, or math. We have attempted to create a more inclusive and engaging environment for STEM-oriented students with the intent of establishing a clientele of students majoring in physics. One of our faculty participated in the successful NSF S STEM program as a steering committee member, and later on the selection committee. The Cal-Bridge mission of helping low-income and underrepresented minorities, especially 1st generation college students, to achieve the pinnacle of a Ph.D. in space sciences, inspired us to attempt similar bridges from middle schools to a community college. If successful, we could then help establish a pipeline from elementary school to a university anchored in low-income areas, helping change the adverse

demographics in the representation of people of color in top STEM jobs. Physics and Astronomy faculty have joined efforts in writing several grants with the ultimate goal of funding initiatives that would foster inclusive student-centered activities at EVC, leading them to acquire skills necessary to boost employability once they complete their bachelor's.

Several attempts were made by our instructors to engage students in out-of-classroom projects, sometimes in partnership with the "Honors Credit Program". To that end, we created a physical science club.

- **2. Please provide an update on the program's progress in achieving the goals (3 years) set during the last comprehensive program review.**

New and Upgraded Courses - The Program has achieved two major landmarks whose intents were communicated in the previous program review. In there, we wrote:

"Investigate the impact of reducing the number of credits (5 to 4) in each of the Physics 4-series courses..." and "Investigate the impact of changing the MATH 013 pre-requisites for the PHYS 002-series to a more rigorous college - algebra-based course..."

We are glad to state that a new PHYS 07-series has emerged, consisting of 3-h lecture and 3-h laboratory exercises, rather than the previous 4-h lecture and 3-h labs. The first course, PHYS 07A was offered in the fall of 2022 and will be followed by the other two courses - PHYS 07B, and PHYS 07C - in 2023. Consequently, the PHYS 04-series is slowly tapering down to be discontinued in Fall 2023. This reduction in credits came in handy for the growing Computer Science program and its new AS-T program.

After several years in the making, we also changed the pre-requisite to PHYS 2-series, the algebra-based sequence which now requires Math 22 or MATH 25 as a pre-requisite, rather than MATH 13. The obvious goal is to ensure that students in the classroom are capable of following the physics taught rather than struggling with basic math.

College STEM with middle schools. Bridging college academics with students attending underserved school systems is a permanent goal of the Physics program in coordination with astronomy and its outreach. This includes efforts to turn some high school students into STEM majors by completing the Certificate of Achievement in STEM (CAS).

Undergraduate Research in Community Colleges - In the previous program review we introduced the Space Technology Academy with the following language:

"The Space and Technology Academy (STA) was conceived by a group of EVC professors as an alternative project to bring diversity to the STEM workforce, and contains elements that will set an underrepresented minority person - women, African Americans, Hispanics, and people with disabilities - on a track to a PhD.... The STA connects K-14 students to forefront scientific knowledge using a collective impact framework composed of nonprofits, community college professors, academic and student programs, high school and middle school teachers, university professors, private labs, engineers and graduate students."

It is clear our attempt to emulate Cal-Bridge's goals of connecting similar underserved populations from CSU to UC. The STA has not materialized yet, but its momentum has yielded opportunities for students such as the California Space Grant Consortium, scattered undergraduate research done by our faculty with students either through the Honors Credit Program or informally in the advanced branch of the EVC-CSI project, and others. One of the associate physics faculty has conducted undergraduate research with students yielding presentations in scientific workshops. The ideas for courses suggested by the STA to foment undergraduate research have been imprinted into the courses ASTRO 20A/B, still in the pipeline.

- **3. Please state and recent accomplishments for your program and show how it contribute to the College's mission and success.**

Courses SLOs 100% completed - About 65% of the faculty teaching physics courses this fall are associate faculty. Again, in 2022, we will submit a request for hiring a new full-time faculty member who will lead the physics program, create connections with local universities and embrace the cause of supporting efforts to bring K12 into our program. The lack of a leading figure in Physics did not stop the semester flow of SLO assessments to the full-timers, although with constant requests and reminders sent to the associate faculty. The PHYS 04-series is being replaced by the new PHYS 07-series with a complete de-activation by fall 2023 - spring 2024. During this transitional phase, SLO assessments have been interrupted on the PHYS 04-series. We project the first cycle of SLO assessments to be closed on spring 2024 in the PHYS 07-series. As a consequence, PLO assessments have been affected by this transition given the substantial changes both the Astronomy and Physics programs have undergone. Again, given our policy of surveying SLO every semester, we expect streaming out assessments and conclusions on both programs by spring 2024.

By investing in the constant revision of four courses and programs, we provide students with access to quality courses and programs, helping to increase enrollment trends, and ensuring student success in courses that are gateways to STEM careers.

Graduation Rate - Graduation in AS-T Physics has been steady at under 20 students a term. As mentioned previously, students are not seeking our courses to major in physics, but we want to change that. We have invested in undergraduate research both in physics and astronomy with the intent of bringing students to the program through dual enrollment who might consider a STEM route, even those who are not considering community college as an option. Courses in Astrophysics such as ASTRO 020A&B provide the necessary baseline to set undergraduate research on a more formal ground in the division.

Investing in out-of-classroom activities in STEM, creating areas of integration, and networking with faculty - especially when developing planned projects, helps the college establish student-centered focus groups that will lead to increased retention and student success.

Student Retention and Student Success - Data indicate our courses have met desirable goals in completion and success. We do observe a decrease in enrollment affecting sections, especially the morning sections. At the closing of the previous program review, we held two successful morning sections/week of Algebra-based and Calculus-based courses (entry-level 0A courses), and now we offer one. The evening term has shown a slight increase in headcount. We closely follow these trends and have adjusted our offerings to accommodate students' needs.

STEM students need in-person contact to better assimilate course content and develop important skills when dealing with equipment. **We do not favor online instruction for physics and uphold clear statements laid out in the CID descriptors.** We consider our laboratory the cusp of instruction, when concepts exposed in lectures meet real-life experiences. It is when hurdles derived from faulty equipment, human errors in data-taking, and bad interpretations of instructions, lead students to confront their frustrations and disappointment, giving instructors a unique opportunity to observe their behavior and help. Students

quite often ask for letters of recommendation, more so given that we have invested strongly in promoting internships and partnerships with 4-year institutes. For that, letters of recommendation are a must. It is in a lab set that we can observe students' behavior and highlight their skills and talents when recommending them for a position. The counterpart is: **we require constant upgrades of lab equipment, without which, we cannot do our jobs** successfully.

By modernizing our laboratories with adequate equipment, we are promoting not only student retention and success but giving them skills that will positively impact employability and smooth transition to the workforce.

Community Integration - Coordination with the astronomy department through the citizen science initiatives has reached higher grounds after the last program review, bringing STEM to over 30 low-income children, with the two oldest participating in the Summer Bridge Program 2022 coordinated by the MSE Division.

By supporting these initiatives, the physics program has engaged with different stakeholders promoting the pre-collegiate activities that increase our visibility in the eyes of the community at large.

- 4. If you received resource allocation for your last program review cycle, please indicate the resources you received and how these resources were utilized to impact student success and / or importance to your program. (The resources can be personnel or fiscal)

We did not receive the resources requested. We summarized major requests in the astronomy program review. For the physics program, major unheard requests are:

1 - Laboratory Technician III - We currently count on 50% allocated time of a lab technician for the entire physics program. We have requested another 50% allocated time.

2 - Full-Time Faculty - The physics courses, especially the calculus-based courses, are attended by students on a route to STEM careers and the current FTEF is 35%.

- 5. Please describe where you would like your program to be three years from now (program goals) and how these support the college mission, strategic initiatives and student success.

Hiring faculty and lab technicians - STEM majors must take calculus-based physics courses before taking transfer-level courses in their majors. Therefore, investing in student success and retention are priorities for the physics program. To that end, increasing the FTEF from the current 35% is a starting point to initiate a series of out-of-classroom activities that will boost student self-confidence, enlarge their view on the job market, and stretch networking with 4-year institutes. In addition, we count 50% of Lab technicians and we urge the hiring of another 50% for physics so we can improve the quality of our evening labs, as well as expand the evening sections.

Upgrade EM Equipment - The Physics 7B laboratory (EM - Electromagnetism) requires constant upgrading to keep students up with advanced technology in the field. We would like to see our function generators upgraded to attend a plurality of input signals, currently limited to *sine* and *step* functions.

Program Set Standards (Summary Tab)

Overall, EVC's Institution Set Standard for success rate is 72%, and the aspirational goal for student success is 75%.

Success Rate (completion with "C" or better)	Program	EVC	Program Set Standard (established during last comprehensive PR)	Program Success Goal (new)
F'15-F'21 average		72.00%		

Program Success Rate 73.27%

Program Set Standard : It is recommended that programs identify a success standard. This standard should reflect the baseline success rate.

Program Set Standard 66%

Recommendation: 90% of the 6 year average success rate could be your program standard (average x 0.9).

Program Success Goal : It is recommended that programs identify a success goal. This goal should reflect the success rate to which your program aspires.

Program Success Goal 75.00%

- Is your program success rate higher or lower than the campus?

It is slightly higher.

- If your success rate is higher than the campus, how are you helping students succeed in and outside the classroom? If your program success rate is lower, what are some strategies your program is implementing to improve?

Students taking physics courses have, for the most part, decided on a major and set themselves on a quest to complete their transfer and move on, therefore making them more objective and efficient. For the most part, they have better math skills and are observant of their GPA, are more cognisant of the college and its available programs.

- Is the current program success rate higher than the program set standard?

The program success rate is not higher than our set goals but it lies within a reachable margin. We expect to reach our goals once a full-time faculty member is hired to lead the physics program, one that has a demonstrated record of promoting out-of-classroom projects to increase student success, developing student cohorts networking to complete projects, and others.

- How close is the program to meeting the program success goal?

The program is within 2% of reaching its goal.

- Are these measures (program set standard and program success goal) still current/accurate? If not, please describe here and reset the standards.

The measures are workable.

Success Rates: Measures by IPEDs Race/Ethnicity

- **American Indian: 102 - 78.380%**
Program Average Total Enrolled
1.000
Program Success Rate
40.000
- **Asian: 9380 - 79.320%**
Program Average Total Enrolled
138.000
Program Success Rate
78.060
- **Black or African American: 464 - 61.430%**
Program Average Total Enrolled
5.000
Program Success Rate
61.160
- **Hawaiin/Pacific Islander: 95 - 65.790%**
Program Average Total Enrolled
2.000
Program Success Rate
75.000
- **Latinx: 9005 - 64.730%**
Program Average Total Enrolled
55.000
Program Success Rate
63.150
- **Two or More Races: 614 - 70.030%**
Program Average Total Enrolled
7.000
Program Success Rate
70.830
- **Unknown: 1655 - 72.640%**
Program Average Total Enrolled
17.000
Program Success Rate
71.820
- **White: 1256 - 73.480%**
Program Average Total Enrolled
17.000
Program Success Rate
73.280

Success Rates: Measures by Gender

- **Female: 12340 - 73.970%**
Program Average Total Enrolled
88.000
Program Success Rate
72.100
- **Male: 10154 - 69.610%**
Program Average Total Enrolled
152.000
Program Success Rate
74.000
- **No Value Entered: 77 - 72.590%**

Program Average Total Enrolled

1.000

Program Success Rate

42.860

Success Rates: Measures by Age

- **17 & Below: 736 - 86.260%**

Program Average Total Enrolled

11.000

Program Success Rate

79.800

- **18-24: 15285 - 69.350%**

Program Average Total Enrolled

167.000

Program Success Rate

72.840

- **25-39: 4470 - 75.390%**

Program Average Total Enrolled

58.000

Program Success Rate

72.320

- **40 & Over: 2065 - 78.860%**

Program Average Total Enrolled

6.000

Program Success Rate

74.330

- **Unknown: 16 - 71.080%**

Program Average Total Enrolled

1.000

Program Success Rate

0.000

- **a. With respect to disaggregated success rates, list any equity gaps that are identified and discuss interventions your program will implement to address these equity gaps? Please include a timeline of implementation and reassessment.**

Underrepresentation of Latinx and females in STEM - We are fortunate to oversee two programs attending different student populations. Astronomy manages descriptive courses attending non-science majors and physics manages courses attending science majors. In the former, female Latinx students are lacking and efforts were set in place prior to the last program review to tackle this issue. These statistics are not unique to EVC, or San Jose, not even California, but reflect a national problem affecting people of color who traditionally live in low-income areas. They are impacted for life by underperforming schools, and unprepared math-science teachers while sharing the pool of future 1st generation college students. The key problem is not in college courses or college structure. It is systemic.

To address this issue, and make use of the powerful outreach capability of the Montgomery Hill Observatory, we created the EVC- Citizen Science Initiatives to establish a bridge between middle schools and colleges. Studies reveal that a student creates his professional identity in that age group. We have partnered with residents to keep this project alive for over 4 years, have assisted over 30 children, and want to make it institutional with the help of the SJECCD Foundation. More specifically, we want to reproduce at EVC or in our district, the success story of the Cabrillo Advancement Program (<https://www.cabrillo.edu/cap/>). To that end, we submit several grant proposals (seven to the NSF, Synopsys Foundation, and California Space Grant Consortium) to promote different aspects of this major pipeline, connecting low-income children to 4-year institutes of higher education and having community colleges as a strong connecting link.

The National Academy of Science, Engineering, and Medicine's report on Minority Serving Institutions (2019) opens its Preface with the following statement: *"Research suggests that the cultural diversity of a nation's workforce is a key factor in its ability to innovate and compete in a global economy. This report on the role of Minority Serving Institutions (MSIs) in creating a diverse science, technology, engineering, and mathematics (STEM) workforce is motivated by the realization that the United States is unlikely to maintain its competitive advantage in STEM without the contributions that these institutions are uniquely positioned to make."* As an MSI, our college plays a pivotal role in facilitating future 1st generation college students' access to all transfer-level courses required for a major in a reasonable two or three years timeframe. To that end, our department understands that we must equip students with skills and tools to compete with peers who have navigated through well-funded K12, attended enrichment summer camps, and received other perks commonly present in high-income households. Navigating against the current euphoria of expanding all contact with students through online interaction, and given the characteristics of our courses and content, we have invested significant time and energy in creating in-person activities outside the classroom, helping students develop computer skills coding, robotics, and others. We want to expand these out-of-classroom events, but the department does not have the resources necessary.

- **b. With respect to disaggregated success rates (ethnicity / race, gender and age), discuss student performance in reaching your program set standard for student success as well as reaching the program success goal.**

The two major groups, Latinx and Asians, have different success stories, although they reproduce national statistics. In one of our grant proposals to NSF (S STEM 2022), we noticed the following:

"The report "Women, Minorities, and Persons with Disability in Science and Technology" (NSF-NCSES, 2021) indicates that Black/African Americans, Latinx/Hispanics, and women are underrepresented in science and engineering, although constituting a significant fraction of the population: Women are 50.1%; Hispanic/Latino, 18.5%; Black/African American, 13.0%; and Asian Americans 6.3%. We must improve access to STEM careers for underrepresented minorities, who are projected to make up 56% of the U.S. population by 2060 (Vespa, Armstrong, Medina, 2018). Another report examining working adults ages 25 and older (Pew Research, 2021) concludes that Latinx accounts for 17% of the U.S. workforce but only 8% of the STEM workforce. Meanwhile, Asians represent 6% of the total workforce but score high in STEM (13%), especially in Computer Science (20%) and Life & Physical Sciences (19% and 18%, respectively). African Americans account for 11% of all U.S. jobs and score even lower in Computer Science (7%) and Physical Sciences (6%). In 2014 (Lazsio, 2014), Google disclosed data on its racial and gender workforce, revealing 83% men, 60% White, and 30% Asian. The insignificant presence of Latinos (2.9%) and Blacks (1.9%) raised a call for action, pushing investments of over \$150 million to overcome such a disparity. As of 2021 (Google, 2021), employment in racial and gender groups has improved - from 2.9% to 6.4 % in the Hispanic group - but the inequity is still dramatic. The tech industry, in general, shares similar data. Massive investments have been made to help businesses assemble a workforce representative of the population, but this move has not significantly impacted the intended target.

East Side San Jose (ESSJ) hosts a population of over 120,000 residents with a racial diversity of 54% of Hispanics and 36% of Asian Americans as the major ethnic groups (Niche, 2022). Although bordering Silicon Valley with companies leading the 6th largest economy globally (Tavares, 2017), 69% of the household income lies below \$100,000 in one of California's most densely populated urban areas (Niche, 2022). More recently, the Silicon Valley Index report (SVI, 2022) has warned that although jobs are back to pre-pandemic levels, income inequality has widened, housing prices have risen, and inflation exploded. In this county (Santa Clara County), the U.S. Department of Housing and Urban Development (USDHUD, 2021) classifies low income for a family of four as \$117,750. On the educational front, only 20% of the residents carry a Bachelor's degree or higher, and additional work is called upon to improve adult education. And reverse the 31% non-completion of high school diplomas (Niche, 2022). The low percentage of graduates in ESSJ households (45% - Niche, 2022) hints at the significant number of future first-generation college students (FGCS) entering community college grounds in their first years."

We are dealing with a systemic issue whose solution requires facing causes lying outside our campus. For example, our academic and special programs have a "Thou shalt not pass" line at 16 years old. We are working through the EVC- CSI project to extend this threshold to embrace younger middle-schoolers, especially those who will be future 1st generation, college students. replacing the vacuum left by the lack of college-educated mentors in their households.

- **c. If your program offers course sections fully online, please contact the office of Research, Planning and Institutional Effectiveness to obtain a student success report on the online sections. Address any differences in student success rates between fully online courses and classroom courses.**

The Physics courses cannot be offered online given their hands-on aspects.

Program Awards - If Applicable

If the classes in your program lead to a degree or certificate, please visit the DataMart and indicate how many degrees/certificates were awarded in your program: http://datamart.cccco.edu/Outcomes/Program_Awards.aspx (http://datamart.cccco.edu/Outcomes/Program_Awards.aspx)

You will need to select drop down menus and then "select program type by major of study" (for example, select Legal for paralegal studies).

Then at the bottom of the report, select the box "program type- four digits TOP", then update report to get program specific information.

Degree Type

- **AS-T**
Number of Awards (Examine 2017-18, 2018-19 data, 2019-20 data and 2020-21 data)
36
Discussion
Data indicate a fluctuation in the number of graduates, keeping it closely below 10 each year as follows:
2017-2018, 4 graduates
2018-2019, 6 graduates
2019-2020, 11 graduates
2020-2021, 8 graduates
2021-2022, 7 graduates

Student Enrollment Types

Student Enrollment Type: Day or Evening Student

- **Day: 4639 - 50.900%**
Program Average Headcount
53.000
Program Percentage of Total
22.100
- **Day & Evening: 2929 - 32.100%**
Program Average Headcount
168.000
Program Percentage of Total

70.000

- **Evening: 1022 - 11.200%**
Program Average Headcount
19.000
Program Percentage of Total
7.900
- **Unknown: 530 - 5.800%**
Program Average Headcount
0.000
Program Percentage of Total
0.000

Student Enrollment Type: Academic Load

- **Full Time: 2259 - 24.800%**
Program Average Headcount
93.000
Program Percentage of Total
38.800
- **Half Time or less than half time: 6084 - 66.700%**
Program Average Headcount
129.000
Program Percentage of Total
54.200

- **a. Discuss any changes in program enrollment types (day vs evening, full-time vs part-time) since your last program review?**

We noticed a decrease in student enrollment during the pandemic, which still persists. Evening sections are filled faster than the morning, forcing us to reduce some calculus-based physics sections in the morning.

- **b. Discuss how do your program enrollments (Pct of total) compare to EVC?**

As noted previously, our evening sections is by far more populated than the day sections, while compared with an average EVC, our students are more part-timers. Providing scholarships to retain students on campus and help them to complete their academic goals in two or three years has been one of our goals when writing grants.

- **c. Based on the data, would you recommend any changes?**

1 - Prioritize hiring a full-time faculty member to oversee the physics program and create out-of-classroom initiatives to retain students and increase completion rate and success.

2 - Prioritize hiring a 50% full-time lab technician to oversee evening and weekend labs.

3 - Create a program similar to the Cabrillo Advancement Program to increase interest in STEM and student enrollment.

Student Demographics - Headcount

Student Demographic: Gender

- **Female: 5008 - 54.950%**
Program Headcount
88.000
Program Percentage of Total
36.670
- **Male: 4075 - 44.640%**
Program Headcount
151.000
Program Percentage of Total
63.040
- **No Value Entered: 37 - 0.410%**
Program Headcount
1.000
Program Percentage of Total
0.530

Student Demographic: Age

- **17 & Below: 486 - 5.310%**
Program Headcount
11.000
Program Percentage of Total
4.570
- **18-24: 5493 - 60.210%**
Program Headcount
166.000
Program Percentage of Total
69.010
- **25-39: 2168 - 23.800%**
Program Headcount
57.000
Program Percentage of Total
24.010
- **40 & Over: 966 - 10.600%**
Program Headcount
6.000
Program Percentage of Total
2.370
- **Unknown: 8 - 0.090%**
Program Headcount
1.000
Program Percentage of Total
0.610

Student Demographic: Race/Ethnicity (IPEDs Classification)

- **American Indian: 40 - 0.430%**
Program Headcount
1.000
Program Percentage of Total
0.470
- **Asian: 3689 - 40.480%**
Program Headcount
138.000
Program Percentage of Total
57.240
- **Black or African American: 208 - 2.290%**
Program Headcount
5.000
Program Percentage of Total
1.950
- **Hawaiian/Pacific Islander: 36 - 0.400%**
Program Headcount
1.000
Program Percentage of Total
0.600
- **Latinx: 3636 - 39.850%**
Program Headcount
55.000
Program Percentage of Total
22.940
- **Two or More Races: 248 - 2.730%**
Program Headcount
7.000
Program Percentage of Total
3.020

- **Unknown: 690 - 7.520%**

Program Headcount

17.000

Program Percentage of Total

7.150

- **White: 573 - 6.300%**

Program Headcount

17.000

Program Percentage of Total

7.340

- **a. Based on the program total headcount and percent change year to year, discuss if your program growing or declining. If so, what do you attribute these changes in enrollment to and what changes will the program implement to address them?**

Not including post pandemic years, the enrollment has been kept constant with a majority of Asian students followed by Latinx students.

- **b. Discuss any gaps have you identified in your program. Discuss how your program enrollment is similar or different from the campus. Discuss which gender, age, and/or ethnic group are proportionally smaller than campus make up.**

Our campus student population is led by Latinx and Asian students. However, our Physics calculus-based courses which are prereqs for computer science, engineering, and physics students - have observed a drastic drop in Latinx enrollment when compared with Asian students, meaning that Latinx students are not set on track for STEM. In fact, this reflects a national trend.

The physics and astronomy departments have set up efforts to help revert this national trend, outreaching middle schools in low-income areas and providing their students with STEM-oriented programs. This project is termed EVC - Citizen Science Initiatives, or EVC-CSI. Our goal is to emulate here, at EVC, the Cabrillo Advancement Program which targets middle school students and provides them support through high school.

- **c. Discuss what interventions the program can implement to address any gaps in enrollment.**

Incentivize programs such as our Division "Summer Bridge Program", which require steady funding from the college, and the EVC-CSI project, still unknown to most of our senior officers.

Institutional Effectiveness (6.5 year average, see Summary Tab)

EVC Capacity: 61.70% EVC Productivity: 14.43

Program Capacity

64.46%

Program Productivity

13.37

Is your capacity rate higher or lower then the campus?

Slightly higher

Is your productivity goal higher or lower than the campus?

Slightly lower

If the program capacity and/or productivity is lower than the campus, please provide rationale:

The WSCH indicates one point less in productivity when compared with the equivalent at EVC. We interpret this as a characteristic of the STEM courses we offer. All physics courses require a set limit on the number of students in a laboratory environment for safety reasons, primarily. In addition, we have set our labs with the goal of having students working either in pairs or alone if it is better for their learning like in circuits.

Curriculum

Related Assessments

AS-T- Created: 10/20/2021 New PLO Assessment Report Originator: Celso Batalha (/Form/Module/Index/1671)

MATH066 F2021- Created: 03/20/2022 New Section Level SLO Assessment Report Originator: Teck Ky (/Form/Module/Index/2376)

Math067- Created: 11/23/2021 New Section Level SLO Assessment Report Originator: Teck Ky (/Form/Module/Index/1887)

MATH 072 - Calculus II with Analytic Geometry Evaluate definite, indefinite, and improper integrals using a variety of integration formulas and techniques. (C-ID objectives #1 and #3)- Created: 12/07/2021 New Section Level SLO Assessment Report Originator: Sithparan Vanniasagaram (/Form/Module/Index/1997)

Math 072 SLO Assessment- Created: 12/07/2021 New Section Level SLO Assessment Report Originator: Sithparan Vanniasagaram (/Form/Module/Index/2000)

MATH 073- Created: 11/01/2021 New Section Level SLO Assessment Report Originator: Laimi Cong-Huyen (/Form/Module/Index/1774)

MATH 073- Created: 01/20/2021 New Section Level SLO Assessment Report Originator: Laimi Cong-Huyen (/Form/Module/Index/1168)

MATH 073- Created: 01/20/2021 New Section Level SLO Assessment Report Originator: Laimi Cong-Huyen (/Form/Module/Index/1169)

PHYS 07A- Created: 01/02/2023 New Section Level SLO Assessment Report Originator: Celso Batalha (/Form/Module/Index/3074)

Courses in the program

PHYS 007A - Calculus - Based General Physics for Scientists and Engineers - I - Active. Implemented on Sep 28 2021 12:00AM (/Form/Course/index/3840)

PHYS 007B - Calculus-Based General Physics for Scientists and Engineers - II - Active. Implemented on Sep 28 2021 12:00AM (/Form/Course/index/3856)

PHYS 007C - Calculus-Based General Physics for Scientists and Engineers - III - Active. Implemented on Sep 28 2021 12:00AM (/Form/Course/index/3857)

MATH 066 - Calculus I Late Transcendentals for STEM - Active. Implemented on Oct 5 2021 12:00AM (/Form/Course/index/4402)

MATH 067 - Calculus II Late Transcendentals for STEM - Active. Implemented on Jan 11 2021 12:00AM (/Form/Course/index/4197)

MATH 073 - Multivariable Calculus - Active. Implemented on Aug 31 2020 12:00AM (/Form/Course/index/4044)

MATH 071 - Calculus I with Analytic Geometry - Active. Implemented on Oct 4 2022 12:00AM (/Form/Course/index/4871)

MATH 072 - Calculus II with Analytic Geometry - Active. Implemented on Jul 23 2020 12:00AM (/Form/Course/index/3870)

- 1. Identify and updates to curriculum since the last comprehensive program review, including and new programs and indicate the 6-year timeline for scheduled course outline revision. For CTE, the time line is 2 year.

PHYS 4-series - The Calculus-based physics courses were redesigned with 1 less contact hour in lectures. As a result, a new PHYS 7-series has been crafted and offered in fall 2022 (PHYS 7A), followed by the entire sequence in 2023.

PHYS 7-series - This has been developed to match most CSU and community colleges' 3h lecture and 3h laboratory. In addition, it has been developed to help create the Computer Science AS-T program, curbing the original 5-units per course offered initially by the PHYS 4A-series.

PHYS 02A - We made significant changes by raising the math requirements to enter a PHYS 2A course. Initially, the pre-req was MATH 013, which has now been switched to MATH 22 or MATH 25.

SLOs revised - All course SLOs have been updated and revised to improve student success.

- 2. Identify all the courses offered in the program and describe how these courses remain relevant in the discipline. For courses your program has not offered in the past two years, please discuss a plan on how to deal with these courses (if your program is not going to de-activate these courses, please explain why).

PHYS 02-series - It consists of PHYS 02A and PHYS 02B, bio, Medical, Kinesiology, and health care students, or those looking for a science course with a lab. The two courses are fully transferrable and have been granted CID #.

PHYS 07-series - It consists of PHYS 07A, PHYS 07B, and PHYS 07C courses, serving all students majoring in STEM. It is a gateway to courses attending their respective majors: computer science, engineering, mathematics, biology (STEM), and Physical Sciences. The three courses are fully transferrable and have been granted CID #.

PHYS 001 - It is a single science GE course for students looking for a science course with a lab.

- 3. If you have a degree or certificate, please include a diagram of your program's guided pathways program map. (A program map indicates courses suggested for each semester, across two years, upon completion a student would qualify for a degree/certificate).

AS-T Physics - This program has been designed as a landmark for students en route to a STEM major. As a necessary stopping point, we thought students would take advantage given by an AS- T degree and complete it along with their major courses or programs. Students graduating in the AS-T are not physics majors in their last majority.

Term 1	Units	CSU GE	IGETC FOR CSU	NOTES
MATH 066 or MATH 071	4 - 5	B4	2A	CORE
ENGL 001A	3	A2	1A	
GE	3	B2	5B	
GE	3	C1	3A	
GE	3	E	Transferable Electives	
Total Units	16 - 17			

Term 2	Units	CSU GE	IGETC for CSU	NOTES
MATH 067 or MATH 072	4 - 5			CORE
PHYS 007A	4	B1/B3	5A/5C	CORE Based on C-ID equivalency, PHYS 004A is an acceptable alternative to PHYS 007A
GE	3	A1	1C	
GE	3	C2	3B	
Total Units	14 - 15			

Term 3	Units	CSU GE	IGETC for CSU	NOTES
MATH 073	5			CORE

PHYS 007B	4			CORE Based on C-ID equivalency, PHYS 004B is an acceptable alternative to PHYS 007B
GE	3	A3	1B	
GE	3	D	4	US-1, US-2, U-S3*
Total Units	15			

- 4. Identify and describe innovative strategies or pedagogy your department/program developed/offered to maximize student learning and success. How did they impact student learning and success?

Videos of Lab exercises - During the pandemic, faculty invested significant time in video-capturing all key lab experiments currently used by adjuncts when teaching these labs.

Physlet Simulations - During the pandemic, faculty created Canvas-based assignments using the award-winning simulations Physlet. Some faculty still use these assignments for extra credit or in-class activities.

Technology in the classroom - Some instructors have introduced "Interactive Classroom" software to enhance student performance and success. Not all the in-person sections use it, but we have encouraged all our instructors to adopt it. In particular, we purchased a subscription to the "ClassPoint.io" software.

- 5. Discuss plans for future curricular development and/or program degrees & certificates included) modification.

We do not have plans to expand our physics curriculum. We do want to improve its current delivery once another full-time faculty member is hired.

- 6. Describe how your program is articulated with High School Districts, and/or other four year institutions. (Include articulation agreements, CID, ADTs...)

Student Learning Outcome and Assessment

Related Assessments

AS-T- Created: 10/20/2021 New PLO Assessment Report Originator: Celso Batalha (/Form/Module/Index/1671)

MATH066 F2021- Created: 03/20/2022 New Section Level SLO Assessment Report Originator: Teck Ky (/Form/Module/Index/2376)

Math067- Created: 11/23/2021 New Section Level SLO Assessment Report Originator: Teck Ky (/Form/Module/Index/1887)

MATH 072 - Calculus II with Analytic Geometry Evaluate definite, indefinite, and improper integrals using a variety of integration formulas and techniques. (C-ID objectives #1 and #3)- Created: 12/07/2021 New Section Level SLO Assessment Report Originator: Sithparran Vanniasagaram (/Form/Module/Index/1997)

Math 072 SLO Assessment- Created: 12/07/2021 New Section Level SLO Assessment Report Originator: Sithparran Vanniasagaram (/Form/Module/Index/2000)

MATH 073- Created: 11/01/2021 New Section Level SLO Assessment Report Originator: Laimi Cong-Huyen (/Form/Module/Index/1774)

MATH 073- Created: 01/20/2021 New Section Level SLO Assessment Report Originator: Laimi Cong-Huyen (/Form/Module/Index/1168)

MATH 073- Created: 01/20/2021 New Section Level SLO Assessment Report Originator: Laimi Cong-Huyen (/Form/Module/Index/1169)

PHYS 07A- Created: 01/02/2023 New Section Level SLO Assessment Report Originator: Celso Batalha (/Form/Module/Index/3074)

Student Learning Outcomes

MATH 066 - Calculus I Late Transcendentals for STEM - Compute and interpret limits of a function using analytic and other techniques when they exist; when limits do not exist, give reasons why for their non-existence. (Rejected)

MATH 066 - Calculus I Late Transcendentals for STEM - Compute and interpret limits of a function using analytic and other techniques when they exist; when limits do not exist, give reasons why for their non-existence. (Active)

MATH 066 - Calculus I Late Transcendentals for STEM - Compute derivatives using limit, differentiation formulas, and implicit differentiation. (Rejected)

MATH 066 - Calculus I Late Transcendentals for STEM - Compute derivatives using limit, differentiation formulas, and implicit differentiation. (Active)

MATH 066 - Calculus I Late Transcendentals for STEM - Apply the definition of continuity to determine whether or not a function is continuous at a real number. (Active)

MATH 066 - Calculus I Late Transcendentals for STEM - Apply the definition of continuity to determine whether or not a function is continuous at a real number. (Rejected)

MATH 066 - Calculus I Late Transcendentals for STEM - Apply differential calculus to sketch the graph of a function, to obtain the equation of the tangent line to a function, and to solve applications such as optimization and related rate problems. (Rejected)

MATH 066 - Calculus I Late Transcendentals for STEM - Apply differential calculus to sketch the graph of a function, to obtain the equation of the tangent line to a function, and to solve applications such as optimization and related rate problems. (Active)

MATH 066 - Calculus I Late Transcendentals for STEM - Evaluate the definite integral using the limit of Riemann Sum, and using the Fundamental Theorem of Calculus. (Active)

MATH 066 - Calculus I Late Transcendentals for STEM - Evaluate the definite integral using the limit of Riemann Sum, and using the Fundamental Theorem of Calculus. (Rejected)

MATH 066 - Calculus I Late Transcendentals for STEM - Use the definite integral to find areas and volumes. (Rejected)

MATH 066 - Calculus I Late Transcendentals for STEM - Use the definite integral to find areas and volumes. (Active)

MATH 067 - Calculus II Late Transcendentals for STEM - Evaluate definite, indefinite, and improper integrals using a variety of integration formulas and techniques. (Active)

MATH 067 - Calculus II Late Transcendentals for STEM - Evaluate definite, indefinite, and improper integrals using a variety of integration formulas and techniques. (Historical)

MATH 067 - Calculus II Late Transcendentals for STEM - Find the derivative of transcendental functions. (Historical)

MATH 067 - Calculus II Late Transcendentals for STEM - Find the derivative of transcendental functions. (Active)

MATH 067 - Calculus II Late Transcendentals for STEM - Evaluate indeterminate forms using l'Hospital's Rule. (Active)

MATH 067 - Calculus II Late Transcendentals for STEM - Evaluate indeterminate forms using l'Hospital's Rule. (Historical)

MATH 067 - Calculus II Late Transcendentals for STEM - Apply integrals and differential equations to problems such as volumes, arc length of a curve, area of a surface of revolution, center of mass, and population dynamics. (Historical)

MATH 067 - Calculus II Late Transcendentals for STEM - Apply integrals and differential equations to problems such as volumes, arc length of a curve, area of a surface of revolution, center of mass, and population dynamics. (Active)

MATH 067 - Calculus II Late Transcendentals for STEM - Apply divergence and convergence tests to sequences and series, and represent functions as power series using different techniques including the Taylor theorem. (Active)

MATH 067 - Calculus II Late Transcendentals for STEM - Apply divergence and convergence tests to sequences and series, and represent functions as power series using different techniques including the Taylor theorem. (Historical)

MATH 067 - Calculus II Late Transcendentals for STEM - Graph and analyze functions in polar and parametric forms, and solve problems by differentiating and integrating such functions. (Historical)

MATH 067 - Calculus II Late Transcendentals for STEM - Graph and analyze functions in polar and parametric forms, and solve problems by differentiating and integrating such functions. (Active)

MATH 072 - Calculus II with Analytic Geometry - Evaluate definite, indefinite, and improper integrals using a variety of integration formulas and techniques. (Active)

MATH 072 - Calculus II with Analytic Geometry - Evaluate definite, indefinite, and improper integrals using a variety of integration formulas and techniques. (Historical)

MATH 072 - Calculus II with Analytic Geometry - Evaluate definite, indefinite, and improper integrals using a variety of integration formulas and techniques. (Rejected)

MATH 072 - Calculus II with Analytic Geometry - Evaluate definite, indefinite, and improper integrals using a variety of integration formulas and techniques. (Historical)

MATH 072 - Calculus II with Analytic Geometry - Apply integrals and differential equations to problems such as areas, volumes, arc lengths, work, and population dynamics. (Historical)

MATH 072 - Calculus II with Analytic Geometry - Apply integrals and differential equations to problems such as areas, volumes, arc lengths, work, and population dynamics. (Rejected)

MATH 072 - Calculus II with Analytic Geometry - Apply integrals and differential equations to problems such as areas, volumes, arc lengths, work, and population dynamics. (Historical)

MATH 072 - Calculus II with Analytic Geometry - Apply integrals and differential equations to problems such as areas, volumes, arc lengths, work, and population dynamics. (Active)

MATH 072 - Calculus II with Analytic Geometry - Graph and analyze functions in polar and parametric forms, and solve problems by differentiating and integrating such functions. (Historical)

MATH 072 - Calculus II with Analytic Geometry - Graph and analyze functions in polar and parametric forms, and solve problems by differentiating and integrating such functions. (Rejected)

MATH 072 - Calculus II with Analytic Geometry - Graph and analyze functions in polar and parametric forms, and solve problems by differentiating and integrating such functions. (Historical)

MATH 072 - Calculus II with Analytic Geometry - Graph and analyze functions in polar and parametric forms, and solve problems by differentiating and integrating such functions. (Active)

MATH 072 - Calculus II with Analytic Geometry - Apply divergence or convergence tests to sequences and series, and represent functions as power series using different techniques including the Taylor theorem. (Historical)

MATH 072 - Calculus II with Analytic Geometry - Apply divergence or convergence tests to sequences and series, and represent functions as power series using different techniques including the Taylor theorem. (Rejected)

MATH 072 - Calculus II with Analytic Geometry - Apply divergence or convergence tests to sequences and series, and represent functions as power series using different techniques including the Taylor theorem. (Historical)

MATH 072 - Calculus II with Analytic Geometry - Apply divergence or convergence tests to sequences and series, and represent functions as power series using different techniques including the Taylor theorem. (Active)

MATH 073 - Multivariable Calculus - Perform vector operations including vector addition, scalar multiplication, the dot product, and the cross product to find triple products, projections, and the equations of lines, curves, planes and surfaces in space. (Active)

MATH 073 - Multivariable Calculus - Perform vector operations including vector addition, scalar multiplication, the dot product, and the cross product to find triple products, projections, and the equations of lines, curves, planes and surfaces in space. (Historical)

MATH 073 - Multivariable Calculus - Analyze multivariable functions and space curves including their graphs; find level curves and level surfaces; find velocity and acceleration pertaining to motion in space; find the arc length and curvature of a curve; and find the unit tangent, unit normal, and unit binormal vectors for a space curve. (Historical)

MATH 073 - Multivariable Calculus - Analyze multivariable functions and space curves including their graphs; find level curves and level surfaces; find velocity and acceleration pertaining to motion in space; find the arc length and curvature of a curve; and find the unit tangent, unit normal, and unit binormal vectors for a space curve. (Active)

MATH 073 - Multivariable Calculus - Determine differentiability; find limits, partial derivatives, directional derivatives, gradient vectors, and differentials of multivariable functions; and find an equation of the tangent plane to a surface at a given point. (Active)

MATH 073 - Multivariable Calculus - Determine differentiability; find limits, partial derivatives, directional derivatives, gradient vectors, and differentials of multivariable functions; and find an equation of the tangent plane to a surface at a given point. (Historical)

MATH 073 - Multivariable Calculus - Find global extrema of a continuous multivariable function on a closed and bounded set; apply the second derivative test to find local extrema and saddle points; and apply the Lagrange multiplier method to solve constrained optimization problems. (Historical)

MATH 073 - Multivariable Calculus - Find global extrema of a continuous multivariable function on a closed and bounded set; apply the second derivative test to find local extrema and saddle points; and apply the Lagrange multiplier method to solve constrained optimization problems. (Active)

MATH 073 - Multivariable Calculus - Set up and evaluate double integrals in rectangular and polar coordinates and triple integrals in rectangular, cylindrical, and spherical coordinates; apply the change of variables theorem for multiple integrals; and apply multiple integration to find volumes, surface areas, centers of mass, moments of inertia, and probabilities using joint probability density functions. (Active)

MATH 073 - Multivariable Calculus - Set up and evaluate double integrals in rectangular and polar coordinates and triple integrals in rectangular, cylindrical, and spherical coordinates; apply the change of variables theorem for multiple integrals; and apply multiple integration to find volumes, surface areas, centers of mass, moments of inertia, and probabilities using joint probability density functions. (Historical)

MATH 073 - Multivariable Calculus - Determine whether a vector field is conservative; find a potential function for a conservative vector field; find the divergence and curl of a vector field; evaluate line integrals using parameterized curves; evaluate surface integrals using parameterized surfaces; and apply the Fundamental Theorem for Line Integrals, Green's Theorem, Stokes' Theorem, and the Divergence Theorem to a variety of science and engineering examples. (Historical)

MATH 073 - Multivariable Calculus - Determine whether a vector field is conservative; find a potential function for a conservative vector field; find the divergence and curl of a vector field; evaluate line integrals using parameterized curves; evaluate surface integrals using parameterized surfaces; and apply the Fundamental Theorem for Line Integrals, Green's Theorem, Stokes' Theorem, and the Divergence Theorem to a variety of science and engineering examples. (Active)

PHYS 007A - Calculus - Based General Physics for Scientists and Engineers - I - Predict the position and velocity of an object moving through space and subject to a range of conservative and nonconservative forces. (Draft)

PHYS 007A - Calculus - Based General Physics for Scientists and Engineers - I - Predict the dynamic evolution of a system subject to an arrangement of conservative and conservative forces. (Draft)

PHYS 007A - Calculus - Based General Physics for Scientists and Engineers - I - Report the uncertainties of physical quantities unveiled in lab exercises, with special care on displaying reasonable number of significant figures. (Draft)

PHYS 007A - Calculus - Based General Physics for Scientists and Engineers - I - Apply the principles of work, energy and momentum conservation in situations involving the motion of bodies in two or three dimensions, in interacting spinning systems, and in fluid dynamics. (Draft)

PHYS 007A - Calculus - Based General Physics for Scientists and Engineers - I - Develop an original project that illustrates principles or laws of classical mechanics, including public presentation of such project. (Draft)

Program Learning Outcomes

Physics - Associate in Science for Transfer: Associate in Science for Transfer - Identify all of the physical quantities in a problem, and define the steps to model and solve real world problems (Draft)

Physics - Associate in Science for Transfer: Associate in Science for Transfer - Use inductive and deductive reasoning to analyze evidence to arrive at logical conclusions (Draft)

Physics - Associate in Science for Transfer: Associate in Science for Transfer - Demonstrate proficiency in assembly of experimental apparatuses to conduct and analyze measurements of physical phenomena (Draft)

Physics - Associate in Science for Transfer: Associate in Science for Transfer - Assess experimental uncertainty to aid in making meaningful comparisons between experiment and theory (Draft)

- 1. On the program level, defined as a course of study leading to degree or certificate, list the Program Learning Outcomes (PLOs), and how they relate to the GE/ILOs. Please also indicate how the course SLOs have been mapped to the PLOs. If you are completing this program review as a department or discipline and do not offer any degrees or certificates, please write N/A in this space.

The AS-T Physics constitutes an opportunity for STEM students to highlight/synthesize their undergraduate achievements into an award. We are not necessarily expecting students from this program to become physicists or have students attracted to it because they seek an academic career in physics. Here are listed the PLOs:

Identify all of the physical quantities in a problem, and define the steps to model and solve real world problems

ILO mapping: Inquiry and Reasoning

Use inductive and deductive reasoning to analyze evidence to arrive at logical conclusions

ILO mapping: Communication, Inquiry, and Reasoning

Demonstrate proficiency in assembly of experimental apparatuses to conduct and analyze measurements of physical phenomena

ILO mapping: Communication, Inquiry, and Reasoning

Assess experimental uncertainty to aid in making meaningful comparisons between experiment and theory

ILO mapping: Inquiry and Reasoning

- 2. Since your last program review, summarize SLO assessment activities and results at the course and program level. Please include dialogue regarding SLO Assessment results with division/department/college colleagues and/or GE areas. Provide evidence of the dialogue (i.e. department meeting minutes or division meeting minutes, etc.) List any SLOs or PLOs that have not been assessed in the last two years and provide an explanation of why they have not been assessed. This will be reviewed by the IEC to determine if your Program Review is approved or not.

SLO assessed - The PHYS 2-series and PHYS 001 courses have been assessed and recycled, and we are committed to attempting surveying every semester. It is a daunting task, though, given that the majority of physics courses are taught by associate faculty.

SLO not assessed -The last program review identified the need to reduce the number of weekly hours from 4 h / week to 3 h/ week, so we stopped collecting assessments early in 2022 as we expect to taper down on the offering of these course sequences. At the same time, we worked to approve the PHYS 07 sequence, with the first course offered in fall 2022. We plan on collecting its SLOs this fall and every semester after. These calculus-based physics courses are core courses for the AS-T program, and so we are lacking in their PLO assessment.

AS-T Program not assessed - With new core courses as part of this program, with the newest being offered in fall 2023, we expect to complete the first cycle of PLOs assessment in fall 2023.

- 3. What plans for improvement have been implemented to your courses or program as a result of SLO assessment? Please share one or two success stories about the impacts of SLO assessment on student learning.

Besides upgrading lab equipment and technology inside the classroom, we expect to improve our physics program when the middle school-college connection bridge is successfully implemented through a program similar to the Cabrillo Advancement Program. In addition, we are seeking to hire a full-time physics faculty who can lead the growth of this program by implementing out-of-the-classroom activities such as those the astronomy department has planned in its area of expertise. .

Faculty and Staff

Part D: Faculty and Staff

- 1. List current faculty and staff members in the program, areas of expertise, and describe how their positions contribute to the success of the program.

1. **Batalha, Celso** – He has worked with Mike Masuda updating course outlines, SLOs, and PLOs, overseeing SLO assessments and their analytics, and introducing a variety of teaching modalities to attend to different students' learning skills. Still, with Mike Masuda, they visited instructors' classrooms and submitted student evaluations for Dean's consideration. Celso has introduced significant modifications to his online asynchronous course to improve students' browsing and communication. In addition, he has attempted to initiate several out-of-classroom activities, including undergraduate research with community college students, which has led to independent study types of courses, ASTRO 20A & 20B, currently in CurriQunet pipeline. Most of his drive is directed toward connecting low-income middle-schoolers from underserved school systems to an environment that is college-oriented. As a result, he has worked with community members organizing a branch of the EVC-CSI project that bridges EVC faculty and students to these middle schoolers. Lastly, he has engaged with faculty and the EVC Academic Senate to create a science museum on the "27 acres" of land belonging to the district.
2. **Duong, Van** - Instructional Laboratory Technician III at Evergreen Valley College (2007 – present) for two departments, Physics (50%) and Chemistry (50%). Her position contributes to program success in the Physics department as follows: She has primary responsibility for ensuring that laboratories run smoothly and safely. Determine, prepare, and provide materials for laboratory experiments and instructor demonstrations. Assist instructors as problems arise. Familiarize new instructors with our facilities and procedures. Oversee lab safety and security. Manage hazardous waste disposal. Help maintain equipment. Support faculties with promoting our programs, including STEM program, Summer Reach, and California Space Grant. Purchase materials, supplies and equipment; deal closely with the Business Office and the Purchasing departments. She maintains department supply budgets and grant budgets. Join the Hiring committee to hire new staff and faculty. She is also a member of the Classified Senate Committee.
3. **Francisco, Ricardo** - The Astronomy program has been successful in its student-centered and outreach initiatives due to the dedicated work of Mr. Ricardo Francisco, currently supported by a grant. Rick is an Instructional Laboratory Technician III, Evergreen Valley College (2017-present), and a former volunteer at the Astronomy department (2015-2017). Assist instructors in planning and setting up laboratories and demonstration equipment for the instructors. Perform annual maintenance of the MHO two observatory buildings, Dome, and Roll of Roof mechanical and electrical systems. Assemble instruments on telescopes and service them, clean and sanitize all used optical eyepieces and hand control pads. He also oversees software updates on all astronomical applications controlling the mounts. Host and support MHO/EVC Astronomy outreach program, and schedule monthly public stargazing events via our Meetup website. We have over 1,500+ members. Support the special faculty programs, California Space Grant, Summer Outreach, STEM, and special Astronomical events and talks. He is a member of the MS3 Emergency Floor Captain team and performs an annual inventory of all astronomy equipment, notifying all instructors of new equipment or software.
4. **Masuda, Michael** - Professor Masuda (MS Physics, BS Physics: Lasers & Optics, BS: Condensed Matter Physics) is a physics and astronomy instructor whose expertise is in utilizing physical demonstrations whenever possible to help students visualize concepts in physics and astronomy. During the 2020 pandemic and lockdown, he spent a few months outside of class recording video footage of lab equipment to be used as video data for the student analysis in physics and astronomy labs. He was also the first to suggest using an inexpensive diffraction grating filter to use the telescopes as astrometric spectrometers in lieu of the availability of funds for the desired \$30,000 spectrometer--a filter that can be used to produce the visible absorption spectrum of stars and galaxies towards the development of future astronomy course labs. He has also become proficient with a digital telescope called the Unistellar EVscope--which he has successfully utilized at the Observatory with a large screen monitor to show local visitors a host of deep sky objects too faint to be seen with normal optical telescopes. In the past, Mike has served as faculty advisor for the EVC Physical Science Club--whose members have volunteered alongside him at the campus Montgomery Hill Observatory during their monthly public Night Sky viewing events. He is also hoping to develop in the near future a zero-credit course for senior members of the local community who are interested in amateur astronomy and telescopes. In regards to the future EVC STEAM museum (originally just a natural science museum but has evolved to include other disciplines and interests in STEAM), he has proposed a novel approach to the proposed planetarium--a PROJECTORLESS planetarium, where the walls, floor, and ceiling have flexible UHD 8K LED screens, similar to the ones used by Lucasfilm for their backdrops in their TV shows. This virtual reality room may serve as a multipurpose system where lecturers of other disciplines can also come in and use the room to dynamically float through an excavation site, fly over a natural biome, rotate the night sky (planetarium), or some other scenic vista footage for educational purposes. It will not have a projector in the center of the room--allowing more flexibility in use. It could also be used by art students to create their own virtual realities, by performing arts faculty to provide realistic moving stage backdrops--the uses are endless, and he is hoping to ask for more than one of these rooms so that a single room will not be overbooked!

In addition to fulfilling their contract jobs, this team of physics and astronomy departments has invested significant time and energy in partnering with the community of residents to create the EVC - Citizen Science Initiatives, intending to connect middle schools in low-income areas to college grounds. We are listing some of their achievements so far.

The EVC Citizen Science Initiatives, Bridging Middle School and College -This crew, making up the core personnel of the Astronomy and Physics departments, have invested intense efforts over the years to help tackle the equity gap in education, leading to a society where different racial groups have a share of the wealth of this nation representative of their population. Elementary and secondary education in science and math serve as a basis for student entry into STEM majors at the college level. However, racial and ethnic disparities in access to upper-level math and science courses and student achievement in STEM are persistent barriers contributing to the small number of underrepresented minorities in STEM. In April 2018, James Lick High School (JLHS), a feeder school for EVC, in which 97% of the student body is a minority and 84% is economically disadvantaged, proposed cutting the school's physics program for the upcoming academic year. Consequently, parents would be faced with the choice of enrolling their child in a further out "wealthier" school or jeopardizing their child's acceptance into college as all University of California campuses recommend students have three core years of science, one of which is traditionally physics. The school leadership's decision to cut physics brought to light an alarming equity issue in the otherwise vibrant and wealthy Silicon Valley. The northern California chapter of the American Association of Physics Teachers intervened by writing petitions against the decision and coordinated a transitional stage where EVC would provide laboratory classes and oversee instruction. Due to the collaboration and activism of a caring community, the school's decision was reversed, and a substitute teacher was hired to lead the program. While the initial aim was to save physics classes at JLHS, a core group of educators, parents, and community members have continued to work to reduce the STEM achievement gap by creating programs that will ensure students have equal access and outcomes in STEM. Moreover, through a shared vision and partnership, we saw how a small group of people could spur significant and ongoing change.

Researchers suggest that a child's decision to enter a specific career or field of study happens in middle school, thereby highlighting the need for effective interventions at an early age to reverse negative perceptions about STEM in general and math in particular. The EVC-CSI program was designed to 1) engage minority and low-income children in STEM at an early age, 2) provide mentorship and weekly interactions designed to expose the participant to the joys of science, math, and technology supervised by college professors, and 3) establish a familial relationship with the children, following their academic development throughout the years up to college.

The establishment of bridges linking middle school to college is considered fundamental to bringing equity to education and promoting changes in the demographics we currently observe in our calculus-based physics courses, gateways to advanced STEM programs.

The California Space Grant Consortium - As a measure to improve student success and retention at EVC, we applied for several grants, with the CaSGC resulting in a positive outcome. It is a consortium between NASA and UCSD, providing cohorts of twelve EVC low-income students with the opportunity to learn robotics and exercise teamwork to produce results. We were awarded on three consecutive terms and await to begin on the next cohort in spring 2023.

Department members have received awards in recognition for the efforts done towards equity in education:

- "Bridges to Diversity and Equity." Award in 2021 by Dr. Byron Breland, the former San Jose Evergreen Community College District Chancellor.
 - "Multicultural Astronomy: Stars of Many Colors." Award in 2021 from Dr. T. Gilkerson, EVC President Humanizing Curriculum and Instruction
- **2. In addition to major professional development activities completed by faculty and staff in the past, in particular with regards to students' success, equity, distance education, SLO assessment, guided pathways and/or innovative teaching/learning strategies, are there any additional professional development needs of your department in the future? What are they? Please provide details about a timeline.**

Faculty teaching DE should attend recycling workshops every two years and be compensated for.

Budget Planning

Part E: Budget Planning

- **1. With your Dean, review the department Fund 10 budget (operational budget) and discuss the adequacy of the budget in meeting the program's needs.**

Three programs share one single budget, and we request these departments to be divided, given that we are currently writing three independent Program Reviews. Physics provides STEM core courses, Astronomy provides GE courses primarily, and Physical Sciences is just one course. If divided, each department's leading faculty would have an independent budget to better plan their department's future growth. As of 2022, these are the funds allocated to the three programs:

2021-2022 operation budget for Physics, Astronomy, and Earth Science:

Physics, Astronomy & Earth Science (1902)

<u>GL Account</u>	<u>Description</u>	<u>Budget</u>
17-21-1902-22500-54100	Supplies Instruction	\$4,315.00 (\$2,873.00 – Physics; \$1,442.00: Astronomy).
10-21-1902-00000-55200	Conference	\$120 (Transferred to Supplies non-instruction and Postage for Physics needs)

- **2. List all external funds, i.e. fund 17, the department/program receives, and describe their primary use.**

10-25-1902-00000-55620	Repair	\$500	(to send broken function generators to vendor to be repaired)
17-25-1902-10506-56411	HERRF Fund	\$3,923.23	(Use all for Physics)

External funds have been received from small grants such as California Space Grant Consortium, Synopsys Foundation, and scattered donations used to support our growing out-of-classroom and K12 projects. Total deposits made on an SJECDD Foundation account are uploaded at the end of this report.

Technology and Equipment

Part F: Technology and Equipment

- **Review the current department technology and equipment needed and assess program adequacy. List and changes to technology or equipment since the last program review. If changes were made please indicate how the change impacted student success.**

Three departments manage laboratories in astronomy, physics, and geology (for Earth Sciences). As such, they must share a budget of under \$10,000 to replace malfunctioning parts, test new lenses, and purchase small parts for the geology labs. The budget IS NOT sufficient to implement significant upgrades to equipment. For instance, physics needs to modernize its functions-generators and oscilloscopes, as some start malfunctioning during labs. We purchased one for testing, but we do not have the budget to purchase 15 units to attend to our students in the lab (they work in pairs, and the lab supports 28 students). In addition, we want to expand our out-of-classroom project on robotics and run it each year, not depending on external fund sources such as is currently supplied by the California Space Grant Consortium (CaSGC). To run this program efficiently, we need to compensate a faculty coordinator for supervising projects of 15 students per term as a non-instruction assignment corresponding to 60 h per term (Feb/Mar/Apr/May/Jun and Aug/Sep/Oct/Nov/Dec). We expect this to solidify students' interests in STEM, boost their self-confidence, and enhance their networking within the college.

This one-time investment (new function generators) and a robotic program are summarized in the table below:

# of items	Description	Price/ea.	Tax + Shipping	Total
15	Oscilloscope InfiniiVision 1000X-Series, 2Ch, 50 Mhz (Part#: EDUX1052A)	\$559.60	\$1,259.00	\$9,65

30	SparkFun Electronics (Arduino) (Part#: 1568-KIT-15267-ND) /year	\$106.95	\$481.28	\$3,68
1	NIA for faculty overseeing the robotic program	\$88.95	NA	\$5,33
1	Dremel DigiLab 3D45-EDU 3D Printer Bundle	\$2,188.47	\$1,969.62	\$15,1
1	HP 24" all- in- one Desktop Computer (Staple Item #: 24506597 Model #: 1J7Q6AA#ABA)	\$839.99	\$755.991	\$5,795
30	3D Printer filament			

Additional Information

Part G: Additional Information

- Please provide any other pertinent information about the program that these questions did not give you an opportunity to answer.**

In this report, we have stressed the hiring of a full-time faculty member for the physics program alone, since the current two full-time faculty invest most of their load in the astronomy program essential, an equivalent of 35% FTEF. In addition, physics has the potential to expand out-of-classroom activities that are essential for boosting confidence, building networks with 4-years institutions, developing computer coding skills, and so many other traces necessary for a successful career in STEM. Astronomy has a robust outreach and out-of-classroom activity, and we want to initiate that in physics. For that, it is crucial to hire a capable instructor who will expand the program.

Future Needs and Resource Allocation Request

Based on the areas noted below, please indicate any unmet needs for the program to maintain or build over the next Comprehensive Review. Please provide rationale on how the request connects back to SLO/PLO assessment, strategic initiatives or student success. If no additional requests are needed in any of the areas, put N/A.

1. Classified Professional Request

Ongoing Budget Needs

Hiring of an Instructional Lab Technician for Physics at a 50% load. Our current lab technician allocated to physics fills, 50% load, leaving unsttende labs that are offered in the morning hours.

One-Time Expenditure

21260

Total Expenses (Staffing and Faculty Requests include Salary and Benefits)

72680.000

Request linked to SLO/PLO

PLO # 1, 2, 3, 4, 5

Strategic Initiatives (student centered, organizational transformation, community engagement)

Yes

Improving student success rates

Yes

Achievement of program set standard for student success

Yes

2. Faculty Request

Ongoing Budget Needs

Full time Faculty who can lead core physics courses and expand the program to increase student retention and success

One-Time Expenditure

Total Expenses (Staffing and Faculty Requests include Salary and Benefits)

161941.000

Request linked to SLO/PLO

PLO # 1, 2, 3, 4

Strategic Initiatives (student centered, organizational transformation, community engagement)

Yes

Improving student success rates

Yes

Achievement of program set standard for student success

Yes

3. Equipment/Supplies**Ongoing Budget Needs**

8100

One-Time Expenditure

21260

Request linked to SLO/PLO #

PLO # 1, 2, 3, 4, 5

Strategic Initiatives (student centered, organizational transformation, community engagement)

Yes

Improving student success rates

Yes

Achievement of program set standard for student success

Yes

Total CostClassified Professional Request

Ongoing Budget Needs: Hiring of an Instructional Lab Technician for Physics at a 50% load. Our current lab technician allocated to physics fills, 50% load, leaving unattended labs that are offered in the morning hours.

One-Time Expenditure: 21260

Total Expenses (Staffing and Faculty Requests include Salary and Benefits): 72680.000

Faculty Request

Ongoing Budget Needs: Full time Faculty who can lead core physics courses and expand the program to increase student retention and success

One-Time Expenditure:

Total Expenses (Staffing and Faculty Requests include Salary and Benefits): 161941.000

Equipment/Supplies

Ongoing Budget Needs: 8100

One-Time Expenditure: 21260

Total Expenses (Staffing and Faculty Requests include Salary and Benefits):

Attach Files

Attached File

EVC Account 198880. pdf.pdf (/Form/Module/_DownloadFile/3021/43425?fileId=289)

Copy of SLO Status for ASTRO PHYS and PHYSC 29Nov2022.xlsx (/Form/Module/_DownloadFile/3021/43425?fileId=290)

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