ANNUAL PROGRAM REPORT

College	Science
Department	Physics
Program	Physics
Reporting for Academic Year	2024-2025
Last 5-Year Review	2023
Next 5-Year Review	2028
Department Chair	Erik Helgren
Author of Review	Erik Helgren
Date Submitted	Sept. 30, 2025

I. SELF-STUDY *(suggested length of 1-2 pages)*

A. Five-Year Review Planning Goals

Five Year Plan (2023 – 2028) Summary

1. Continue to assess and revise as necessary the courses offered by the Physics program.
2. Build a strong and inclusive department community.
3. Continue to provide strong General Education and service course offerings, with some of the GE course offerings provided in online or hybrid mode.
4. Develop a department strategy to support all faculty with incorporating high impact practices into their curriculum.
5. Develop and implement a strategic plan to promote sustainable and measured growth in the number of majors in the program.
6. Request the addition of at least one new tenure-track hire.
7. Continue to promote and strengthen the Physics seminar series.
8. Continue to provide undergraduate research experiences for all interested majors, and other STEM majors where possible.
9. Invest in additional state-of-the-art laboratories and hands on learning equipment for teaching and research.
10. Improve Equity Gaps in lower-division Physics and Astronomy Courses.

B. Progress Toward Five-Year Review Planning Goals

1. **Continue to assess and revise as necessary the courses offered by the Physics program.**

   Following the CSU initiative to align classes to the state CAL-GETC pattern, we reviewed all courses offered in the physics department, particularly looking at the learning objectives for classes satisfying the B1 and B3 (now 5A and 5C) Physical Science and Laboratory Science requirements. The following courses were found to have learning objectives in good agreement with the updated General Education Learning Objectives and have been submitted via Curriculog for approval by the College Curriculum committee and CIC in AY 2023-24: (those with * were further revised)

   ASTR 108 Astronomy of Indigenous Cultures (B1 & Diversity Overlay)
   ASTR 138 Descriptive Astronomy (B1)
   ASTR 139 Astronomy Laboratory (B3)
   PHYS 104 Musical Acoustics (B3)
   PHYS 106 Physics for Future Leaders* (B3, Sustainability Overlay)
   PHYS 109 Exploring Physics in the Outdoors (B3, Sustainability Overlay)
   PHYS 115 Elementary Physics (B3)
   PHYS 125 Principles of Physics I (B3)
   PHYS 126 Principles of Physics II (B3)
   PHYS 135 Physics for Scientists and Engineers I (B3).

   *In order to increase enrollment Physics 106, Physics for Future Leaders, was revised to be compatible with an online synchronous format.

   The course PHYS 271, Physics of Inclusive Dance, was found to be lacking the full criteria of the new B3/5C designation and was not submitted for recertification.

   In the past, PHYS 230 Physical Reasoning has satisfied the second composition requirement. GEOC is now combining Critical Thinking GE courses with Second Composition, so we decided to follow this path and combine our Second Composition course with the GE-1B Critical Thinking requirements. It is a very natural fit for the class with the key change being an enhanced emphasis on argumentation, reasoning, logic, and fallacies (which were already covered in the existing class to some degree). The syllabus is revised accordingly and submitted for recertification.

2. **Build a strong and inclusive department community.**

   Department meetings, held monthly, are open to all tenure-track and tenured (TT) and Lecturer faculty and students. The students are invited to each meeting to report on any student needs and provide input on department issues.

Students, by their own suggestion, will accompany faculty in recruiting presentations at local community colleges. We will give the students small stipends from our donner for giving their time to this important effort.

3. **Continue to provide strong General Education and service course offerings, with some of the GE course offerings provided in online or hybrid mode.**

Service courses for majors requiring various Introductory Physics courses (depending on level of complexity and Math) continue to be a major component of what the faculty teach for our department. These courses include:

- PHYS 115 – Elementary Physics (for General Studies students) being offered both on-ground and online,
- PHYS 125-126 – Principles of Physics I & II, the year-long Algebra-based course for majors in e.g., Biology, Environmental Science, Kinesiology, Construction Management, and pre-Medical students, being offered on-ground only (as most graduate programs require on-ground modality and because lab learning outcomes can only be achieved through hands-on coursework)
- PHYS 135, 136 & 137 – Physics for Scientists and Engineers I, II & III, the 3-semester long, Calculus based course for majors in e.g., Physics, Computer Science, Engineering, Chemistry etc. being offered on-ground only (lab learning outcomes can only be achieved through hands-on coursework)
- An upper division service course we teach for the Department of Speech Language and Hearing Sciences, is PHYS 304 – Acoustics which had been requested by that department a number of years ago, was taken off of the roadmap in 2024-25 so the Department of Physics will no longer offer that course starting in AY 2025-2026.

One large effort over the last year has been the move to free textbook and online homework for our introductory physics courses (Phys 125, 126, 135, 136), spearheaded by Dr. Smith. We traditionally have used the Pearson textbook and online support, which costs ~$130. Knowing that many of our students are making big sacrifices to pursue their education at CSUEB, we want to reduce their out of pocket costs when possible. We are now testing **O**pen **E**ducational **R**esources (OER) in the curriculum of core offerings of the physics department. The project consists of developing and aligning course materials: lecture slides, online homework problems with hints and guided practice examples, pre-lecture assignments, and aligning all course materials including labs, demonstrations, lecture outlines, and reading assignments. I built online Canvas shells that incorporate the OER textbook chapters (from the open-source project textbook OpenStax) into Modules with exercises and homework problems (from the open-source project MyOpenMath) to enable instructors in our department to implement zero-cost materials into their sections. By transitioning to OER, we aim to alleviate this financial burden and ensure that all students have equal access to high-quality educational resources, promoting inclusivity and student success.

4. **Develop a department strategy to support all faculty with incorporating high impact practices into their curriculum.**

For Physics majors, there are four high impact practices with prime applicability.

(i) engagement in research with faculty,
(ii) involvement in summer internships,
(iii) mentorship through a culminating senior experience, and
(iv) creation of a learning community.

For (i), the department offers our majors opportunities to work directly with faculty on meaningful hands-on research experiences.

For (ii), the department provides workshops and support for majors seeking summer internship experiences. In 2023-24 approximately 50 % of our upper division Physics majors participated in summer internships.

For (iii) , our major does not have a Capstone experience and in the coming years the TT faculty will consider adding this or some other type of culminating senior experience.

For (iv), as an effort to strengthen our faculty learning community, at our monthly department meetings, we dedicate time to discuss pedagogy and curricular matters, including engaging teaching strategies, high impact practices and alternative grading strategies. We also provide access to our Advanced Laboratory classroom to our majors to serve as a study room which student use as a center to develop a student learning community.

5. **Develop and implement a strategic plan to promote sustainable and measured growth in the number of majors in the program.**

During the 2023-2024 academic year there was particular scrutiny on "low-degree confirming programs", which included the Physics Department. Though overall assessment of the department was very positive, with emphasis on the high percentage of students going to graduate programs, the high level of student-involvement in research, and the high amount of external funding brought in by the department, the faculty nevertheless took it as an opportunity to seriously reflect on how to grow the number of students in the department. (While the small numbers do facility personal attention, there is room to grow without losing this important quality.)

We will be visiting physics departments at the top 10 feeder community colleges to talk with students about Physics at CSUEB. We will bring current physics majors to give a peer-based description of what it's like to be a physics major at CSUEB. After targeting the community colleges we plan to set up visits to local high schools.

We have students keeping up a department Instagram, showcasing our seminars and

student research. New physics majors and prospective majors are invited to join to help keep abreast of the ongoings of the physics community. We also are looking for ways to improve the common area we have reserved for students to study and hang out. Students say that one of the things they like most about the department is the sense of community, so we want to support this as much as possible. National studies around retention of physics majors have also highlighted the importance of the sense of community and belonging in a department.

We are in communication with the Math department about developing "4+1" master's programs between Physics and Math.

6. **Request the addition of at least one new tenure-track hire.**

Physics tenure-track faculty continue to teach below half of the courses offered by the department. In Fall 2024 the TT faculty account for only 46% of the units taught by the department. With the inclusion of the new Civil Engineering program, and a concomitant increase in the number of service courses we will need to offer over the coming years we anticipate that we will need at least one new hire. Furthermore, Dr. Amy Furniss, an Associate Professor in the department recently left the department for a position at UCSC, making our need for a tenure-track hire shall be even more dire.

7. **Continue to promote and strengthen the Physics seminar series.**

This seminar series serves as a means to strategically grow our number of majors but also provide a sense of community and inclusion among all Physics enthusiasts and everyone interested in science. A donor-funded endowment allows us to provide food and beverage after the seminar where faculty, staff, and students are able to interact.

The seminars are held every Friday at noon and are hosted in a hybrid format, so that outside speakers can join by Zoom, but also so that interested students and faculty can join by Zoom as well. In fact Dr. Scott Hildreth , the chair of the Physics department at Chabot Community College attends weekly with a large number of Physics majors form his classes at Chabot.

We will also continue to make sure the seminar series continues to provide professional development workshops for the students, including Impostor Syndrome, Implicit Bias in the Sciences, Applying to Summer Research Opportunities and Refining Resumes.

Physics majors who participating in summer research programs are invited to give seminars. Because we had so many majors participate in summer research, the majority of our 2024 Fall seminar series will be given by students! This is an excellent skill to hone for our majors, and the friendly atmosphere of our seminar series gives

them a safe place to practice speaking professionally and publicly answering questions about their research.

8. **Continue to provide undergraduate research experiences for all interested majors, and other STEM majors where possible.**

Our TT faculty, Kimball, Phipps, Smith, Grimm, and Helgren are actively engaging with students to provide undergraduate research experiences.

During AY23-24, Dr. Phipps mentored one CSR scholar who performed measurements of cryogenic capacitors and resistors to assist the SPLENDOR dark matter experiment. Another research student wrote Python code to perform a gain measurement of the SPLENDOR charge amplifier. Beginning Spring 2024, three CSUEB Physics majors have assisted in testing readout electronics and fabricating readout cables for the EOS neutrino experiment hosted at UC Berkeley. These students were also able to attend the 2024 APS April meeting through the EOS subcontract.

In AY 2023-24 Dr. Kimball operated a number of research programs including the Search for Non-Interacting Particle Experiment (SNIPE), a search for axion-like dark matter candidates using highly sensitive magnetometers. The program culminated with a field experiment in the Sierras in the summer of 2024 where students and other department faculty and staff also attended, and set up the experiment and recorded data for a week. Dr. Kimball is also the Scientific Coordinator of the Global Network of Optical Magnetometers for Exotic physics searches (GNOME), an international collaboration that uses atomic magnetometers to search for transient signals originating from Earth's passage through large-scale composite dark-matter objects or bursts of exotic fields generated by astrophysical phenomena such as black hole mergers. Dr. Kimball and his students have worked on a new state-of-the-art helium-3 sensor to improve GNOME's sensitivity and published several papers on its operation.

In the summer of 2024 Dr. Helgren coordinated the third cohort of the Advancing STEM Pioneers in Research in Energy Sciences (ASPIRES) program in collaboration with the Institute for STEM Education and the Berkeley National Laboratory (LBL). The program placed 12 CSUEB College of Science majors in 10-week paid internships in the Energy Sciences Area at LBL.

During the spring of 2024, Dr. Helgren worked with colleagues at SJSU and at local National Labs, LBL and SLAC to coordinate submitting a Department of Energy (DOE) Office of Science (SC) FY 2024 Reaching a New Energy Science Workforce (RENEW) grant in the area of High Energy Physics that was submitted in the summer of 2024. The goal of the RENEW program is to develop and broaden an inclusive workforce in STEM by funding partnerships between DOE national labs and partner minority serving institutions (MSIs). Helgren is the lead Principle Investigator (PI) for the grant, totaling over $1.2 million over three years, and the proposal is currently under review.

In the summer of 2024 Dr. Grimm brought one CSUEB Physics major to Geneva, Switzerland to work with her at CERN on the Large Hadron Collider on the ATLAS experiment. In the summer of 2024, Dr. Grimm was awarded a $510k three-year grant from NSF to continue her research with the ATLAS Experiment.

Grimm also served as mentor for another CSUEB Physics major in the GROWTH-MSI program, a DOE RENEW grant (separate from the grant proposed by Dr. Helgren); through that program, the CSUEB physics major spent the summer doing research for ATLAS at Lawrence Berkeley Labs

9. **Invest in additional state-of-the-art laboratories and hands on learning equipment for teaching and research.**

In AY 2024-25 we used A2E2 funding to help support hands-on learning.

- We purchased a new Zurich Instruments data acquisition platform for measurements and experimental control in our Advanced Lab courses (majors take 4 semesters of Advanced Lab).
- Also for Advanced Lab, we purchased Liquid Instruments Moku Lab and Moku Go hardware platforms that are digital signal processors with versatile, low-noise analog inputs and outputs. These can be used in a variety of experiments in the lab, in particular, for the calorimeters used to measure the lifetime of cosmic muons.
- We have developed a package of hands-on lab materials (e.g., magnets, batteries, wires, LED bulbs, etc.) to be sent to online students in our PHYS 115 class so that students could fully participate in hands-on learning for this course.

10. Improve Equity Gaps in lower-division Physics and Astronomy Courses.

During the 2024-2025 academic year the Physics department successfully **eliminated the equity gaps** in our courses! Specifically, the equity gap for our course were +1.57% and +3.10% for the Fall 2024 and Spring 2025 semesters respectively. Since we started analyzing equity gaps for the Physics department (AY 17-18), our Equity Gap percentage for the department (difference in DFW rate for Non-URM students compared to URM populations) has fluctuated between -3% and -10% (larger percentage was during COVID online modality). Equity gap data is obtained from Pioneer Insights. As a department we have made a concerted effort to close our equity gaps in our courses for the past eight years, and we are truly excited to have accomplished this goal. It was a distinct pleasure to share the most recent equity gap data with faculty members at our department meeting.

The Physics department is particularly dedicated to learning about and using more inclusive assessment practices, including for instance, standards-based grading. Standards-based grading is now regularly used by Dr. Kimball, Dr. Grimm, and Dr. Wedding in Physics 115, 135, 136, and 230. Alternative assessment practices, such as exam re-grades are also used in other large service courses, e.g., PHYS 125 and 126.

Over the summer of 2023, Dr. Smith participated in the full week Academy that was run jointly between CSUEB and Santa Clara University known as the Anti-Racist Liberatory

Pedagogy Academy (ARPLA). The implementation of these research-validated pedagogies contributes to providing effective education to the CSUEB multiethnic and culturally-diverse student population. ARLPA helps faculty develop teaching skills and materials that enhance their ability to provide culturally sustaining learning experiences. Dr. Smith has already put the techniques learned at this academy into practice in the classroom, and has shared his experiences and practices with the department.

Department of Physics DEI Action Plan: In an effort to address Equity Gap issues and other Diversity, Equity and Inclusion (DEI) concerns, the Department of Physics developed a DEI Action Plan in 2021 that was incorporated in our past five-year review. The plan, developed by department faculty, staff and students in response to many of our lived experiences is summarized below:

The Department of Physics is committed to improving and sustaining diversity, equity and inclusion in all aspects of our community. Our plan focuses on two areas in particular,

1) DEI in the classroom, i.e., a focus on decreasing equity gaps in the Physics General Education and Physics service courses that we teach, and

2) DEI in the department, i.e., a focus on courses and students in our major, as well as the general Physics community, including faculty, and staff.

Specific programs, efforts and actions that the physics Department has and will partake in are listed below. Many of these actions address both DEI in the classroom and in the department.

- Review equity gap data in our service courses as well as in our major courses regularly with faculty at department meetings, e.g., at department meetings, at least once a semester, update the faculty regarding past-semester results and trends in equity gaps. Starting in spring semester 2021, the equity gap data for our department was shared with faculty at a department meeting to initiate the discussion of a greater focus on equity gaps in our classes. This has continued each year.
- Make faculty more aware of campus resources and programs that are aimed at supporting students, e.g., provide faculty with a summary of campus resources to be included on syllabus.
- Encourage faculty to join faculty learning communities, such as the "Improving STEM Teaching Faculty Learning Programs," and the "Interdisciplinary Peer Observation Program (I-POP)," to learn about and share best/high-impact practices with faculty at department pedagogy meetings.
- Encourage faculty participation and support for CSUEB peer-mentoring programs, e.g., STEM Lab Learning Assistants and SCAA tutoring.
- Continue our department's efforts in Communities of Practice, e.g., in 2019 our department faculty and staff joined the American Physical Society (APS), Inclusion Diversity and Equity Alliance (IDEA) Network. The APS – IDEA network is focused on empowering and supporting physics departments to identify and enact strategies for improving equity, diversity, and inclusion (EDI). Although our department is no

longer part of the APS IDEA network as of 2024, we continue to follow the best practices we developed while in the community.

- Continue our department's support of providing hands-on meaningful research experiences to our diverse Physics majors, with support from:
    - the NSF-funded UC-CSU Cal-Bridge program. The Cal-Bridge program directly funds and supports, through holistic advising, underserved students in Physics to achieve the goal of graduating and going on to graduate school in Physics or Astronomy.
    - the CSUEB OSCAR program, nee Center for Student Research, and in particular the NSF-funded Louis Stokes Alliance for Minority Participation (LSAMP) program. Unfortunately, the NSF LSAMP program has been discontinued as of May 2025.
    - faculty-grants from NSF and other funding agencies.
- Continue making DEI an integral part of our weekly Physics Spitzer Seminar Series, e.g., seeking diverse speakers, having all speakers address DEI issues
- Continue holding annual Imposter Syndrome & Implicit Bias Workshops to foster a greater sense of belonging and community.
- Maintain a commitment to make a focus on diversity a high priority in all faculty and staff hiring that occurs.
- Continue outreach efforts to Physics and Astronomy departments at local Community Colleges to foster the pipeline of traditionally underserved students transferring to CSUEB to complete their degrees in Physics.

C. Program Changes and Needs

Report on changes and emerging needs not already discussed above. Include any changes related to SB1440, significant events which have occurred or are imminent, program demand projections, notable changes in resources, retirements/new hires, curricular changes, honors received, etc., and their implications for attaining program goals. Organize your discussion using the following subheadings.

Overview:

The department of Physics continues to provide high-quality teaching for all students in Physics courses as well as extraordinary research opportunities for CSUEB Physics and other majors. As part of the department commitment to providing and assessing the quality of instruction, peer-evaluations of all instructors is performed annually as part of the annual review cycle. Each tenured or tenure-track (TT) faculty member is assigned to review other TT faculty and the Lecturer faculty. Constructive feedback and ideas to include engaging, high-impact teaching strategies and alternative grading techniques are shared with instructors based off of these peer-evaluations.

In AY 2024-25, the Physics faculty mentored over 20 undergraduate students in meaningful hands-on research projects throughout the year.

Along with on-going multi-year funded grants, the Physics department faculty actively sought and obtained extramural research funding to support their research programs and provide hands-on experiences to CSUEB students. Table 1 below lists the grants awarded to Physics faculty in AY 24-25 (it was a productive year!).

Table 1 - List of grants that TT Physics faculty applied for/awarded in AY 2024-25

Grant	PI/Co-PI	Award years	Agency	Amount
Collaborative Research: Studying the Nature of the Higgs Boson and Searching for New Physics at the Large Hadron Collider with the ATLAS Experiment.	Grimm	2024 - 2027	National Science Foundation (NSF)	$510,000 over three years
Bay Area Accelerator Traineeship (BAART); a Reaching a New Energy Science Workforce (RENEW) grant	Helgren	2025 - 2027	Department of Energy (DOE)	$660,000 over three years
Establishing Sub-Kelvin Quantum Measurement Capability at Cal State East Bay	Phipps	2025-2026	Department of Defense (DOD)	Request for $615,000 pending
Cryogenic Charge Amplifiers for Sub-GeV Dark Matter; a Funding for Accelerated, Inclusive Research (FAIR) grant	Phipps	2025-2026	Department of Energy (DOE)	$400,000 over two years
SPLENDOR Pathfinder Experiment: Dark Matter Detection with Quantum Materials; QuantiSED2.0 grant	Phipps	2025 - 2029	Department of Energy (DOE)	Sub-award of $2.95 million over 4 years NOT funded
RAdiation Detection Investigations by CALifornia Undergraduates Training Program (RADICAL); MSIPP grant	Phipps	2025 - 2027	Department of Energy (DOE)	$730,692 over three years (terminated by DOGE!)
Collaborative Research: RUI: BSM-PM: Exotic Physics Searches with Magnetometer Networks	Kimball	2025 - 2028	National Science Foundation (NSF)	$300,001 over three years
Exploring Quantum Noise and Gyroscopic Spin Dynamics in Levitated Ferromagnetic Torque Sensors	Kimball	2025 - 2029	Air Force Office of Scientific Research (AFOSR)	$999,158 over four years
Sub-contract on Challenge Institute for Quantum Computation – UC Berkeley and UCLA are lead institutions on the this grant	Kimball	2025 - 2031	National Science Foundation (NSF)	$45,000,000 over 6 years (CSUEB sub-award is relatively small)

Curriculum:

The department of Physics prides itself on providing a rigorous curriculum both in our lower division service and general education courses as well as in our upper division major courses, that is delivered with care and empathy, recognizing that we support a wide range of students here at CSUEB. This attention to providing excellent teaching has resulted in two of the department faculty being named the George and Miriam Phillips Outstanding Professor (Kimball and Helgren). As described above, the faculty engage in a continuous improvement cycle of assessing and incorporating new, engaging teaching strategies to continue to improve the delivery of our curriculum.

Our service courses include PHYS 115, 125, 126, 135, 136, and 137. In AY 24-25 Dr. Ryan Smith worked with the chair and other faculty in the Department of Biological Sciences to develop new curriculum for our PHYS 125 and 126 service courses (those being required for Biological Sciences majors), to better engage the students. Specifically, Dr. Smith developed new material that drew on biomedical examples that would be more meaningful for the Biological Sciences majors.

Our upper division curriculum continues to prepare our majors extremely well for next steps in their desired trajectories. Last year, all of our graduating seniors in the Spring of 2025 were accepted to Ph.D. graduate programs in Physics. However, students also are well prepared for myriad other career options. A Physics BA major who graduated in the Fall of 2024, Katelyn Centeno, had a lifelong desire to teach Physics in high school. We are proud to report that she is now enrolled in the Teacher Credential program at CSUEB and is well on her way to becoming the next best Physics high school teacher in California!

Students:

Overall in AY 2024-25, the Department of Physics graduated **eight** students. This contradicts what is specified in the Institutional Research "one-pager" attached in the appendix, which claims the department only graduated 3 students. It is our opinion that the institutional research analysis seems to not count double majors or postbaccalaureate students.

In the Spring of 2025 the department graduated seven students with the B.S. in Physics:
Antonio Martinez, Jasmin Asfour-Palacios, Lucas Teague, Luana de Almeida Pacheco, Stephen Gutay, David Kimble, and Ryan Miller.

Four of these students were accepted into Ph.D. graduate program, e.g., UCSC, UC Davis and Stony Brook University. Three of the four students accepted into Ph.D. graduate programs (Marinez, Asfour-Palacios and Teague) were Cal-Bridge scholars, receiving focused advising from the Physics faculty at CSUEB and generous funding from the Cal-Bridge program. For Cal -Bridge scholars attending a UC graduate program, they continue to receive funding to support their graduate school education, thus lowering their financial burden in obtaining both their B.S. and Ph.D.

Luana deAlmeida Pacheco (the daughter of our very own chair of the Department of Biological Sciences, Dr. Ana Almeida) is now pursuing a career in coupling the fields of Physics and Biology.

Three students who graduated, Kimble, Gutay and Miller were returning students, i.e., post-baccalaureate students. Stephen Gutay is now working at the Lawrence Livermore National Laboratory in the Global Material Security Program. David Kimble had a long, successful career in Statistics in Industry, and has been pursuing his Physics B.S. here at CSUEBover thepast few years out of interest. Ryan Miller is a decorated Army veteran, wounded in Iraq, losing his leg. He has an MBA from Harvard and returned to take classes here at CSUEB. Both David and Ryan participated in undergraduate research with Derek Kimball, and they both extol the virtues of the Physics department as a hidden gem!

In the Fall of 2024, the department graduated Katelyn Centeno with the B.A. in Physics. Katelyn is currently pursuing her teaching credential at CSUEB to become a high school Physics teacher.

Faculty:

The department only had four active tenure/tenure-track (TT) faculty in AY 2024 -2025. Former Dean Singley was on professional leave during that year as he transitioned form serving as the Dean of the College of Science to retreating back into the department faculty starting in the Fall semester 2025. During the 2024-25 AY, Erik Helgren served as the interim Associate Dean in the College of Science.

Table 2 - List of TT faculty in AY 2024-25 and Fall 2025 by rank

Academic Year	Chair	Asst. Prof.	Assoc. Prof	Full Prof.
2024 – 2025	Grimm	Phipps* (applying for early tenure)	Grimm Smith* (applying for full professor)	Kimball Helgren (serving as Assoc. Dean)
Fall 2025	Helgren	none	Grimm Phipps	Singley Kimball Helgren Smith

Staff:

The Department of Physics Instructional Support Technician (IST) left at the end of the 2023-2024 academic year to pursue graduate school. Due to the university hiring chill, no new IST search was initiated in 2024-2025. The summer of 2024 was spent coordinating and training IST from other departments in the College of Science plus one part-time physics major to step in and fill the role of the Physics Department IST. In the summer of 2025 the university approved the hire of a new IST to work jointly in the Departments of Physics and Chemistry and Biochemistry. The new hire, Van Le, started in August 2025 and is working alongside a department hired student assistant to help prepare all of the instructional laboratories.

Since the implementation of the "hub" system in the College of Science where groups of departments' office staff were merged to form centralized hubs, we do not have any other Physics Department staff. The Natural Sciences hub services the departments of Physics, Biological Sciences, Earth and Environmental Sciences and Chemistry and Biochemistry. This has worked fairly well,

but we do miss having a "face" to the department, someone on our floor who students could come to with questions (see next section).

Resources: *(facilities, space, equipment, etc.)*

With the implementation of the Natural Sciences hub, our office manager moved from our erst-while Physics office, North Science 231 to the Natural Sciences hub in North Science 431. The Math/Psychology/Statistics hub moved one office team member into the location where the Phys-ics office manager had been located in N231, but the Physics mail and supply rom and the char's office remained in N231. This has been extremely awkward as students, faculty and staff seeking to "find" the chair of the Physics department are likely confused when they get to the door of the Psychology/Math/Statistics office.

We continue to be constrained by laboratory space, both for teaching laboratories and research lab space for our faculty. We hope that with the construction of the new Braddock Center for Science and Innovation, and the "relocation" of some faculty and teaching lab space to that building that Physics will be able to gain both teaching and research lab spaces to further engage with students.

Assessment:

Our department assessment coordinator has been compiling our assessment results and in keeping faculty informed on what assessment tasks they need to be working on each term based on what classes they are teaching. She also coordinates with the College of Science Associate Dean to coordinate assessment across the college.

See additional assessment report/data below.

Other: *(e.g., major program modifications)*

As discussed above, due to the feedback from the Focused Program Review process that oc-curred during AY 24-25, the Department of Physics faculty convened a task force during the summer of 2025 to consider changes to the major programs, i.e., the B.S. and B.A. degrees.

The faculty have agreed to streamline the Physics programs, reducing the required number of up-per division Advanced Lab course from four to two. We are confident that the students will still be able to master the Program Learning Outcomes associated with developing high quality ad-vanced labs skill sin the two remaining Advanced Labs we will retain in the curriculum. The course revisions and program modification proposals are currently being worked on and/or sub-mitted to Curriculog for implementation in AY 2026-27. Pre-emptive communication advising of students in the program is also being planned to minimize disruption on students.

II. SUMMARY OF ASSESSMENT *(suggested length of 1-2 pages)*

A. Program Learning Outcomes (PLO)

List all your PLO in this box. Indicate for each PLO its alignment with one or more institutional learning outcomes (ILO). For example: "PLO 1. Apply advanced computer science theory to computation problems (ILO 2 & 6)." Program Learning Outcome(S) Assessed. *List the PLO(s) assessed. Provide a brief background on your program's history of assessing the PLO(s) (e.g., annually, first time, part of other assessments, etc.)*

Physics B.S. Program Learning Objectives: (words in bold highlight difference between BS/BA)

1. *Fundamental Principles: **Explain** the fundamental principles of Physics and be able to apply these core ideas to analyze physical processes (ILO 2: Communication)*
2. *Problem Solving: **Apply** quantitative reasoning and critical thinking to solve complex problems, both theoretical and experimental in nature; (ILO 1: Thinking and Reasoning)*
3. *Technical Skills: **Independently** learn new technical subjects and skills; (ILO 1: Thinking and Reasoning)*
4. *Conduct and Analyze Experiments: **Design**, construct, assess and troubleshoot experiments, quantitatively analyze the results using appropriate statistical procedures and tests of systematic errors, and draw meaningful conclusions; (ILO 1: Thinking and Reasoning)*
5. *Communication: Effectively discuss scientific ideas, both theoretical and experimental, to diverse audiences through written and oral presentations, both formal and informal; (ILO 2: Communication)*
6. *Teamwork and Collaboration: Work professionally, effectively, and inclusively as a member of diverse collaborations to solve problems. (ILO 3: Diversity & ILO 4: Collaboration)*

Physics B.A. Program Learning Objectives:

1. *Fundamental Principles: Describe the fundamental principles of Physics and be able to apply these core ideas to analyze physical processes; (ILO 1: Thinking and Reasoning)*
2. *Problem Solving: Use quantitative reasoning and critical thinking to solve problems, both theoretical and experimental in nature; (ILO 1: Thinking and Reasoning)*
3. *Technical Skills: Learn new technical subjects and skills; (ILO 1: Thinking and Reasoning)*
4. *Conduct and Analyze Experiments: Construct, assess and troubleshoot experiments, quantitatively analyze the results using appropriate statistical procedures and tests of systematic errors, and draw meaningful conclusions; (ILO 1: Thinking and Reasoning)*

5. *<u>Communication</u>: Effectively explain scientific ideas, both theoretical and experimental, to diverse audiences through written and oral presentations, both formal and informal; (ILO 2: Communication)*
6. *<u>Teamwork and Collaboration</u>: Work professionally, effectively, and inclusively as a member of diverse collaborations to solve problems. (ILO 3: Diversity & ILO 4: Collaboration)*

The CSUEB Institutional Learning Outcome (ILO) numbers referred to above correspond to the following:

(1) **Thinking and Reasoning:** think critically and creatively and apply analytical and quantitative reasoning to address complex challenges and everyday problems.

(2) **Communication:** communicate ideas, perspectives, and values clearly and persuasively while listening openly to others.

(3) **Diversity:** apply knowledge of diversity and multicultural competencies to promote equity

and social justice in our communities.

(4) **Collaboration**: work collaboratively and respectfully as members and leaders of diverse teams and communities.

(5) **Sustainability**: act responsibly and sustainably at local, national, and global levels.

B. Summary of Assessment Process

Summarize your assessment process briefly using the following sub-headings.

Instrument(s):

We utilize standardized tests, the Force Concept Inventory (FCI) and the Brief Electricity and Magnetism Assessment (BEMA), to assess PLOs 1 and 2. These exams have multiple choice questions on introductory and advanced physics concepts, and are accepted as standard measures of content within the physics field. For example, the FCI is designed to assess student understanding of the most basic concepts in Newtonian physics. This forced-choice instrument has 30 questions and looks at six areas of understanding: kinematics, Newton's First, Second, and Third Laws, the superposition principle, and types of forces (such as gravitation, friction). Each question offers only one correct Newtonian solution, with common-sense distractors (incorrect possible answers) that are based upon student's misconceptions about that topic, gained from interviews. The BEMA assesses what students know about the most basic and central concepts of Electricity and Magnetism. It is comprehensive, covering topics from the Coulomb force law to magnetic induction, but omitting radiation because it is very common for the introductory course not to get that far. It has been used by various instructors in various settings and has been judged an appropriate assessment of introductory E&M by physicists experienced in teaching E&M at various levels. It is not aimed at any particular curriculum but contains only those elements common to all calculus-based introductory

courses. During the 24-25 AY the BEMA exam was given in Electricity and Magnetism. The FCI will be given during the current 25-26 AY in Analytic Mechanics.

In order to assess PLOs 3 and 5 we have utilized writing and oral presentation rubrics that have been created by CSU East Bay Physics faculty and have been adopted as standard within the Physics Department. The Rubrics allow a scaling of specific measures of quality written problem solutions, written research papers and presentations. The rubrics, each of which is provided to the students as part of the introduction to the assignment, were developed by the physics faculty independently, through a collaborative comparison of assessment criteria utilized within their own grading policies. Specifically for PLO3, assessment of learning new technological skills is gauged using grades on the skills taught and the grade on the final project, in which students are required to use these skills to solve a problem.

Sampling Procedure:
The standardized testing assessments are given to the students in class. The rubric assessments are applied to the student final presentations and research papers at the end of the term. It is important to note that the students have access to these rubrics ahead of the assignment deadline, but do not have any access to the standardized tests in any form aside from when given during the class meeting.

Sample Characteristics:
The standardized testing sample is a specific percentage of correct answers at the end of the term as compared to correct answers at the beginning of the term. The overall improvement is used as an assessment of the effectiveness of the teaching methodologies utilized to communicate the specific PLOs.

Data Collection:
The data is collected on scantron or in a google form for the standardized tests and recorded in rubrics. The standardized test results are organized by topic, so that individual portions of the class can also be assessed.

Data Analysis:
An assessment of whether students have mastered the PLOs is made based on the results of the rubrics. Comparison of improvements from one year to the next year is also reviewed. (This piece had considerable disruption in and after COVID. We are still working to ensure good comparison of year-to-year results for our rubric-based assessments. A shared folder is kept of results, to be reviewed at department meetings.)

C. Summary of Assessment Results during the 2024-2025 AY

PLO Assessed: PLO 1 *Fundamental Principles: Explain the fundamental principles of Physics and be able to apply these core ideas to analyze physical processes (ILO 1: Thinking and Reasoning).* This PLO was also assessed in Physics 451, E&M II, using the BEMA standardized test, and in Physics 340, Statistical Physics and Thermodynamics, using a rubric to grade a specific problem set.

Main Findings:
Using the BEMA **post-test results** from 12 students, we observe an average score of 17.7 out of 30 (59%). This represents a strong improvement compared to a typical pre-test baseline of 35%, yielding a **normalized gain of approximately 37%**, which is a notable increase from the ~20% gain observed in 2016–17. These gains approached the values seen in more interactive curricula such as targeted interactive Matter and Integration courses at NCSU and CMU (https://journals.aps.org/prper/abstract/10.1103/PhysRevSTPER.5.0201<05). The instructor for this course also provided a written report of the assessment with strategies targeting further improvements.

Assessment in Physics 340, Statistical Physics and Thermodynamics, showed all students passing the rubric grade assignment.

Recommendations for Program Improvement: The instructor for Phys 451, E&M II, offered the following suggestions for improvements in future offering of the course:
- Embed more foundational problems into early assignments.
- Add regular pre-flight reading quizzes.
- Incorporate group problem-solving sessions and short in-class reviews.

Next Step(s) for Closing the Loop: Results of this assessment will be shared at the departmental meeting and will be passed to the next instructor for these courses. In future years, we will look for multi-year trends in the student results.

D. Assessment Plans for Next Year

Summarize your assessment plans for the next year, including the PLO(s) you plan to assess, any revisions to the program assessment plan presented in your last five-year plan self-study, and any other relevant information.

In 2025-2026, we plan to assess Program Learning Outcome 2: ***Solve Problems:*** *Use quantitative reasoning and critical thinking to solve complex problems, both theoretical and experimental in nature; and additionally,* Program Learning Outcome 4: ***Conduct and analyze experiments:*** *Construct, assess and troubleshoot experiments, quantitatively analyze the results using appropriate statistical procedures and tests of systematic errors, and draw meaningful conclusions.*

PLO 2 will be assessed in Analytic Mechanics, Phys 330. A specific problem will be included on a midterm and graded with a rubric. The same problem is giving each time the course is offered, testing foundational understanding of forces.

PLO4 will be assessed in Advanced Lab III, Phys 481. Each year this course is offered students are given the same assignment:

> *Students independently design an experiment to measure the acceleration of gravity, including statistical methods to assess the accuracy of experimental setup.*

The assignment is assessed in the same manner each year and compared to the results from previous years.

Year 1: 2025-2026	
1. *Which PLO(s) to assess*	PLO 2
2. *Is it aligned to an ILO?*	Yes
3. *If yes, list ILO.*	Thinking and Reasoning
4. *Course name and number*	PHYS 330 Analytic Mechanics
5. *SLO from course*	Students will be able to develop models and apply advanced mathematical techniques, such as vector calculus differential equations, and Fourier series, to solve physics problems. Students will be able to identify an appropriate coordinate system, and analyze physics problems in several different coordinate systems. Students will be able to explain the behaviors of physical systems that are undergoing oscillations, under the influence of a central force, in a non-inertial reference frame, or undergoing rotation.
6. *Assessment activity*	Specific problem set solved by students (same set each year)
7. *Assessment Instrument*	Rubric used to score problems
8. *How data will be reported*	Quantitative
9. *Responsible person(s)*	Dr. Kathryn Grimm (Department assessment coordinator)
10. *Time (which semester(s))*	Fall 2025
11. *Ways of closing the loop*	Qualitative results are included in assessment report for annual department report, comparing scores according to rubric.

Year 1: 2025-2026	
1. *Which PLO(s) to assess*	PLO 4
2. *Is it aligned to an ILO?*	Yes
3. *If yes, list ILO.*	Specialized Discipline, particularly: Demonstrating fluency in the use of tools, technologies and methods in the field
4. *Course name and number*	Physics 481: Advanced Lab III
5. *SLO from course*	Design, construct, and troubleshoot experimental equipment; use appropriate statistical analysis methods to quantitatively compare experimental results to the physical model.
6. *Assessment activity*	Have students independently design an experiment to measure the acceleration of gravity, including statistical methods to assess the accuracy of experimental setup
7. *Assessment Instrument*	Rubric for scoring student experiment method and results
8. *How data will be reported*	Quantitative
9. *Responsible person(s)*	Dr. Kathryn Grimm (Department assessment coordinator)
10. *Time (which semester(s))*	Fall 2025
11. *Ways of closing the loop*	The quantitative scores from the lab on this activity will be included within the department annual report and compared to methods and scores from previous years.

III. DISCUSSION OF PROGRAM DATA & RESOURCE REQUESTS *(suggested length of 2 pages)*

Each program should provide a one-page discussion of the program data available through University Dashboard. This discussion should include an analysis of trends and areas of concern. Programs should also include in this discussion requests for additional resources including space and tenure- track hires. Resource requests must be supported by reference to University Dashboard data.

Requests for tenure-track hires should indicate the area and rank that the program is requesting to hire. If a program is not requesting resources in that year, indicate that no resources are requested.
Enrollment Trends

A. Discussion of Trends & Reflections on Notable Trends;

Summarize and discuss any notable trends occurring in your program over the past 3-5 years based on program statistics (1-2 paragraphs). You may include 1-2 pages of supplemental information as appendices to this report (e.g., graphs and tables).

The statistics about the department related to demographics and enrollment have been relatively stable over the 5 years if we include the rising number of post-baccalaureate student enrollment in our program. In some instances this is good: the department has not been significantly affected by the university-wide decreases in enrollment; and, the demographics of the department show race/ethnicity percentages in line with the university as a whole, and this we do not wish to change.

In previous year we sought to place an emphasis on graduating our majors faster (the average had been 6 years), but in our current year's Physics Program one-pager (attached below in the appendix section) from IER, it is showing as 4.9 year. We do still plan to streamline the major by reducing the total number of units in the major (by dropping two of Advanced Lab courses from the program).

With Dr. Jason Singley retreating into the department faculty from his role as the Dean of the CSCI, we currently (Fall 2025) have a higher number of tenure-track faculty teaching courses in our department than has been the norm in previous years (64% in Fall 2025, whereas in prior years the percentage has been under 50%, and was much lower in AY 24-25 due to Dr. Erik Helgren serving as interim Associate Dean of the College of Science).

The percentage of TT faculty teaching courses in the department would be much higher, but for the fact that in the past years, faculty in the department of Physics have been including grant funding to buy out teaching load rather than only including summer salary. For comparison, in AY 24-25 approximately 6% of the department's teaching WTUs were bought out from TT faculty grants, but in Fall of 2025 so far, it is approximately 23% of our semester's teaching WTUs that are being paid for by external grant funding. Of course, this grant funded "buyout" has multiple

benefits. The university gains a larger amount of indirect cost funds form the grant, and since the TT faculty is bought out from teaching, the courses can be assigned to lecturer faculty to maintain their employment and entitlement load.

Of note, the department "one-pager" only indicates that three students graduated in AY 24-25, so that seems to be a discrepancy compared to our own departmental records as discussed above.

Reflections on Trends and Program Statistics:
Provide your reflections on the trends discussed above and statistics and supplemental information presented in this report.

We continue to graduate on average 4-5 majors each year. Though this is small compared to other majors, according to the American Institute of Physics annual report on Physics program enrollments, the national average number of majors graduated by Physics programs from undergraduate only programs is under five, thus we are on par with the national norm.

Nevertheless, there are places we would like to improve: we would like to grow the major-- we feel we have the resources to serve double the current number of majors. We would like to increase the percentage of women in the major, bringing it closer to 50%.

B. Request for Resources *(suggested length of 1 page)*

1. Request for Tenure-Track Hires:

In Sumer 2024 one of the department's six TT faculty, Dr. Amy Furniss separated from the university for a position at UC Santa Cruz. Dr. Furniss was our resident Astrophysicist and we would like to re-hire faculty member for spearhead our Astronomy minor and to provide research opportunities in the field of Astrophysics for our majors. However we recognize the with Dr. Jason Singley retreating into our department from the CSCI Dean role, we currently (Fall 2025) have a higher number of tenure-track faculty teaching courses in our department than has been the norm in previous years (64% in Fall 2025, whereas in prior years the percentage has been under 50%). Thus, though we hope to eventually backfill our vacant Astrophysics faculty line, there are reasons that the request is not as high a priority as in previous years.

2. Request for Other Resources

Of greatest concern to the Physics Department is the quality of the hands-on lab experience for students both in the introductory Physics courses and the upper division courses. A2E2 fees have been used by our department to support the hands-

on lab experiences. With these funds missing we will begin to see our labs (a cornerstone of the Physics program) degrade. We would strongly encourage that the administration recognize the importance and cost of lab based curriculum and provide adequate funding to support these courses.

Furthermore, with the opening of the Braddock Center for Science and Innovation, we are respectfully requesting that as new College of Science space is made available, either in the new building or as a function of faculty/departments moving into new space in the BCSI, that the Physics department receive due consideration for gaining extra research and/or teaching laboratory space.

IV. APPENDIX

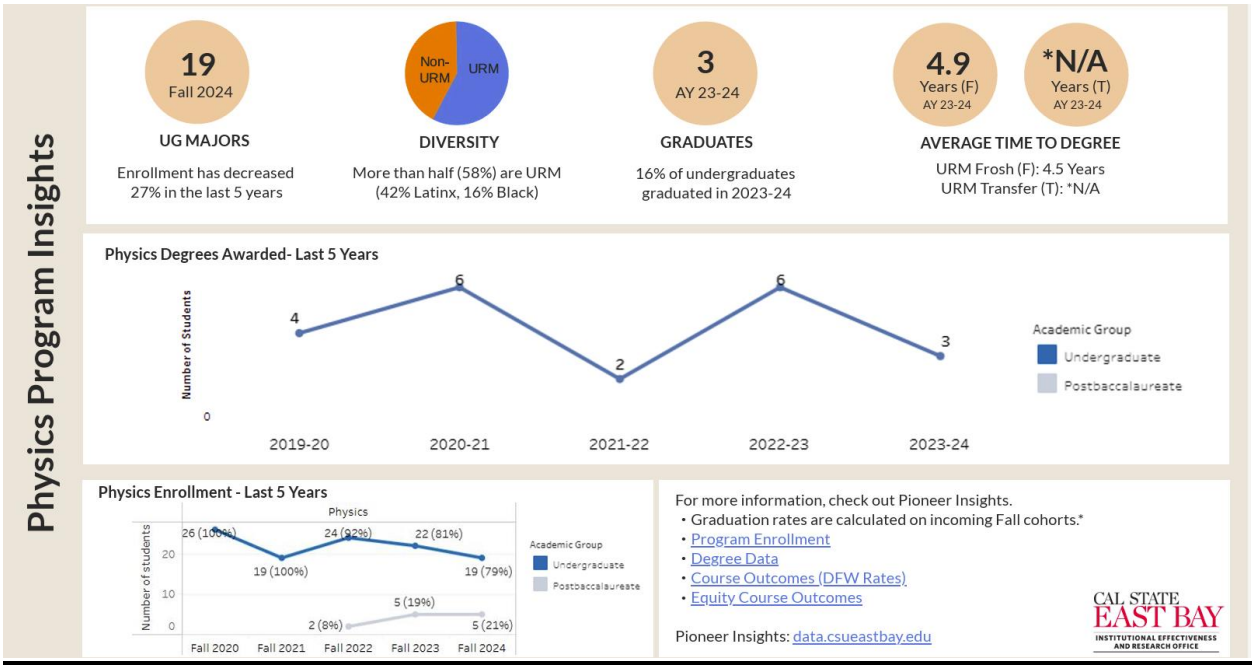

Figure 1 - IER "one-pager" for the Department of Physics

Physics: Admit Type

		Fall 2020		Fall 2021		Fall 2022		Fall 2023		Fall 2024	
		n	%	n	%	n	%	n	%	n	%
Undergraduate	First-time Frosh	18	69%	14	70%	17	68%	14	61%	10	53%
	Transfer	8	31%	6	30%	8	32%	9	39%	9	47%
	Total	26	100%	20	100%	25	100%	23	100%	19	100%
Postbaccalaureate	First-time Graduate					2	67%	4	100%	5	100%
	Transfer	1	100%	1	100%	1	33%				
	Total	1	100%	1	100%	3	100%	4	100%	5	100%
Grand Total		27	100%	21	100%	28	100%	27	100%	24	100%

Figure 2 - Pioneer Insight table of ALL student in the Physics program. Of note, the above "one-pager" indicates that the number of majors has fallen by 27% in the past 5 years, however if post-baccalaureate students are included, the number of student in the Physics program has in fact remained quite steady over the past five years.