ANNUAL PROGRAM REPORT

College	College of Science
Department	Physics
Program	Physics
Reporting for Academic Year	2019-2020
Last 5-Year Review	2018
Next 5-Year Review	2023
Department Chair	Erik Helgren
Author of Review	Erik Helgren
Date Submitted	September 28, 2020

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

A. Five-Year Review Planning Goals

Five Year Plan (2018 – 2023) Summary

The planning goals set forth for the Department of Physics include:

1. **Implement, assess and revise as necessary the semester courses offered by the Physics program.**

2. **Develop a department-specific Retention, Tenure and Promotion (RTP) manual.**

3. **Continue to provide strong General Education and service course offerings.**

4. **Develop a department strategy to support all faculty with incorporating high impact practices, such as research based instructional strategies, into their curriculum.**

5. **Develop and implement a strategic plan to promote sustainable and measured growth in the number of majors in the program.** We specifically wish to target growth in traditionally underserved student populations in the field of Physics and STEM. This strategic plan needs to take into account current and new resources and should also take into account best-practice marketing strategies.

6. **Request the addition of at least two new tenure-track hires.** Tenured/tenure-track (TT) faculty teach major, GE and service courses and we expect growth in all these categories over the coming years. The TT faculty are also needs to provide more research opportunities and hands-on experiential learning for our students**.** Any new approved TT hires need to have a plan to incorporate undergraduate research opportunities and at least one new TT hire needs to be in the field of Astronomy.

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 among all Physics enthusiasts and everyone interested in science. For instance, the seminar

series will be held during the University Hour, but we will need to monitor and assess the impact on attendance and the availability of outside speakers.

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

9. **Invest in upgraded and state-of-the-art laboratory and hands on learning equipment for teaching and research.** Furthermore, the program needs to develop a plan to improve the storage and proper use of lab and demonstration equipment.

10. **Monitor and support the newly designed Astronomy minor to assess the possibility of growth.**

B. **Progress Toward Five-Year Review Planning Goals**
Report on your progress toward achievement of the 5-Year Plan. Include discussion of problems reaching each goal, revised goals, and any new initiatives taken with respect to each goal.

1. **Implement, assess and revise as necessary the semester courses offered by the Physics program.**

In the 2019-2020 AY, the department went through the curricular procedures to re-certify all of the department's GE area B1 and B3 courses (along with any accompanying overlays). This included PHYS 104, 105, 106, 107, 108, 115, 125, 126, 135, 138 and 139.

Due to COVID, the department decided to adjust some of the offered upper division major courses offered during this online-only year, specifically we are opting to not offer PHYS 481 that Advanced Lab IV class which typically has students running hands-on lab-based projects (a project-based-learning model) working closely with a faculty member in the student lab research classroom. In lieu of this 3 units class needed for graduation, we individually advised our majors to take an alternate 3 unit elective course from the two being offered during AY 20-21, i.e., PHYS 460 Astrophysics or PHYS 463 Particle Physics.

2. **Develop a department-specific Retention, Tenure and Promotion (RTP) manual.**

A draft of the Department-specific RTP manual that was circulated to the tenure-track faculty in 2019-20 was found to need more specific details regarding details for professional development activities in a wider array of Physics subfields. This work is ongoing. However, the draft was shared with the new first-year tenure-track faculty member, Dr. Arran Phipps who joined our department faculty in August 2020 and it provided additional guidance, even in draft form, as it is intended to do.

3. **Continue to provide strong General Education and service course offerings.**

As discussed below in section III "DISCUSSION OF PROGRAM DATA" we have seen a decrease in the overall enrollment in Physics GE and the PHYS 125-126 service courses, but an increase in the number of students enrolling in the PHYS 135, calculus based introductory Physics sequence.

One area of concern, vis-à-vis the precipitous drop in the number of freshmen enrolling in Physics GE courses over the past years, is the training of FASST advisors who have been purposefully steering students away from Physics courses due to perceived difficulty of the subject. The Physics department is committed to offering rigorous, interesting and thought-provoking General Education classes. However if advisors are trained to steer students away from "rigorous" classes, or if they are not trained to encourage students to push themselves in college by taking interesting classes and just acceding to unjust stereotypes, then the Physics GE offerings might need to be curtailed due to these choices. The alternate solution seemingly is

that we should dumb-down our curriculum, a process which ultimately leads to diluting the strength of a degree from CSUEB. However, regarding the relative difficulty of the course, as measured by the DFW rate[1], the facts are as follows:

- in 2018, the Freshman GE B1 course "How Things Work" had a DFW rate of 6% (4 of 69 students) and the GE B1 & B3 Freshman course "Musical Acoustics" had a DFW rate of 4% (2 of 51 students), and
- in 2019, the Freshman GE B1 & B3 course "Elementary Physics" had a DFW rate of 4% (2 of 57 students) and the GE B1 course "Physics for Future Leaders" had a DFW rate of 14% (6 of 44 students).

4. **Develop a department strategy to support all faculty with incorporating high impact practices, such as research based instructional strategies, into their curriculum.**

In order to hold more frequent discussions regarding best-practices in teaching our Physics courses, we continue to hold monthly department meeting (as opposed to twice a semester in previous terms). The more frequent meeting have allowed greater opportunity to discuss pedagogy and curricular matters with both tenure-track and lecturer faculty in the room.

Also, in the Spring 2020 semester, due to switching to online modality, we had numerous open forums in Physics sharing best practices regarding how to deliver high quality online synchronous and asynchronous classes. For instance faculty were instructed on using department issued iPads and Apple pencils to serve as a digital whiteboards in lectures which mimics the in-class ability to write out complex Physics equations on chalkboards/whiteboards, and provide sketches and graphs for students to visualize the concepts.

Furthermore, in the Spring 2020 semester, the Physics department piloted a number of Slack channels, one specifically including all lecturer, tenured and tenure-track faculty to provide a resource for sharing ideas and best-practices including on the subject of online teaching.

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

The department is still committed to formulating a coherent plan to promote sustainable and measured growth. Within the department discussions have centered on reaching out to local community colleges, e.g., CCC, DVC Los Medanos, Chabot, Ohlone, Las Positas, to the chairs of the Physics departments to advertise the support structures and opportunities we have here at CSUEB.

One area of achievement that we use to promote the Physics department at CSUEB, is the fact that Dr. Amy Furniss has been named the co-director of the **Cal-Bridge**, NSF funded mentorship

[1] https://csusuccess.dashboards.calstate.edu/public/faculty-dashboard/where-do-they-struggle accessed Sept. 2020

program. This program provides "intrusive" advising for underserved populations of Physics students at all CSU campuses with the goal of increasing the number of diverse students earning Ph.Ds. in Physics and Astronomy. Benefits include the weekly mentoring/advising from CSU and UC faculty, up to $10,000 per AY and support in applying for graduate school.

In recognition of the fact that in 2017, under 4% of the bachelor's degrees awarded in the U.S. in the field of Physics were earned by African Americans, and only 10% of the bachelor's degrees awarded in the U.S. in the field of Physics were earned by Hispanic Americans,[2] in AY 2019-2020 the CSUEB Physics Faculty applied for and were accepted as a pilot institution for the American Physical Society's Inclusion, Diversity and Equity Alliance (**APS IDEA**). The APS IDEA is a new initiative with a mission of empowering and supporting Physics departments, laboratories, and other organizations to identify and enact strategies for improving equity, diversity, and inclusion (EDI). It will do so by establishing a community of transformation. We hope to continue to do better than the national average here at CSUEB and through our efforts in the APS IDEA network we hope to find pathways for more students from traditionally underserved populations to earn a degree in Physics.

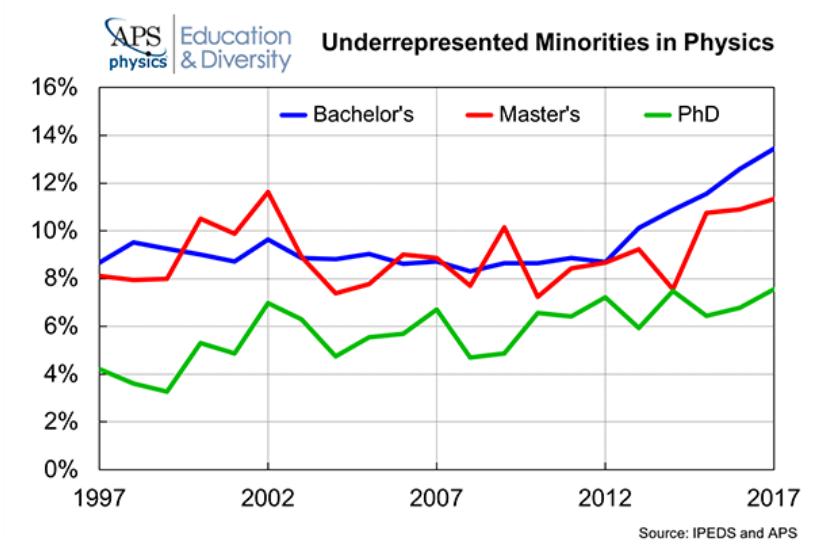

Figure 1 - This graph shows the percentage of bachelor's, master's, and doctoral degrees awarded to underrepresented ethnic and racial minorities (URMs) in physics at U.S. institutions. In this case, URMs include African Americans, Hispanic Americans, American Indian/Alaska Natives and Native Hawaiians. (This report from APS came out in 2017 so these are the most up to date statistics). In 2017, a total of 1097 Doctoral degrees in Physics were conferred in the U.S. and 83 were conferred on URM students (19 Black/African American and 62 Hispanic/Latino). In 2017, a total of 8102 Bachelor degrees in Physics were conferred in the U.S. and 1090 were conferred on URM students (263 Black/African American and 800 Hispanic/Latino). In 2017, CSUEB graduated awarded 2 Physics B.S. degrees to Black/African American students accounting for 1% of the nation's total.

6. **Request the addition of at least two new tenure-track hires.**

[2] https://www.aps.org/programs/minorities/resources/statistics.cfm accessed Sept. 2020

Dr. Arran Phipps, (post-doc. From Stanford & Ph.D. in Physics from UC Berkeley) joined the tenure-track faculty in the department of Physics in the Fall of 2020. It was an unusual, virtual start for Dr. Phipps, but he has handled the situation with aplomb.

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

   The Spitzer seminar series continues to be very popular with students faculty and staff. The shift to an all online format has had both its detriments and benefits. We miss meeting with all of our community on Fridays at noon on campus, however, we have been able to invite a broader, more diverse group of outside speakers who have been able to join us via Zoom. With the current state of affairs in the nation, and our continuing awareness of the lack of diversity in the Physical Sciences, we decided to focus our Spitzer seminar series on "diversity" this year. We have made efforts to ask non-academic Physicists to speak at our seminar series this year to provide role-models for our students on non-traditional career paths for Science majors. We invited Dr. Lance Menthe from RAND Corporation to speak about his experiences as a gay professional in the Aerospace and Defense sectors.

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

   - Dr. Grimm continues to engage undergraduates and graduate students from CSUEB working on projects associated with the large Hadron Collider (LHC). Highlights include students working at Stanford performing technical work associated with new sensors to be installed at the LHC.

   - Dr. Furniss continues to mentor CSUEB students in conjunction with her work at the VERITAS gamma ray observatory in Arizona and other partnerships. She works with both Physics majors and other STEM majors year-round.

   - Dr. Kimball continues to lead international dark matter serach collaborations GNOME and CASPER. CSUEB students, both Physics and other STEM majors, work with him year-round in his CSUEB research labs.

   - Dr. Ryan Smith continues to mentor Physics and other STEM majors in his research labs here at CSUEB working on ultrafast spectroscopy techniques.

     Due to COVID, many of the on-campus research activities were curtailed when the shelter in place orders were issued in March of 2020. However, the faculty continued to hold group meetings and switched their efforts to activities amenable to online/remote work, e.g., data analysis, coding, writing up progress reports, etc.

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

We continue to use research to update our advanced lab and lower division lab equipment as needed for improved student learning.

In the AY 2019-20, Dr. Ryan Smith coordinated our department's Physics demonstrations and compiled a shared google sheet @Physics Demos categorized by topic and learning objective, including links to germane videos and a list of the demonstration equipment physical location in the Physics department storage rooms/closets.

10. **Monitor and support the newly designed Astronomy minor to assess the possibility of growth.**

    The Astronomy minor continues to draw interest and in AY 2019-20 we had three Astronomy minors graduate (our first minor graduated in AY 18-19). We will continue to advertise the minor and track the number of students in the years to come. The prefix ASTR was approved by the CSUEB Senate in the Fall 2020 and our plan is to officially list many of the Astronomy related courses with this prefix rather then PHYS in order to draw more attention to the Astronomy minor.

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.

Honors received by faculty, in AY 2019-20:

Dr. Amy Furniss received the CSUEB award for Outstanding Researcher for Untenured Faculty and has ongoing grants from NSF and NASA. Dr. Furniss also was awarded the NuSTAR Cycle 6 Guest Observer award as PI, that comes with 20 hours of observing time on a hard X-ray NASA satellite and $57k to support the analysis and interpretation of the data.

Dr. Ryan Smith was awarded the College of Science Collaborative Research award and also received a grant from the German Academic Exchange Service (DAAD) for is upcoming sabbatical for "Research Stays for University Academics and Scientists"

Dr. Erik Helgren was awarded a grant from PG&E to support the CSUEB Social Impact Solar Program.

Dr. Kathryn Grimm has an ongoing grant from NSF.

Dr. Derek Kimball was awarded the College of Science Spitzer Distinguished Faculty award and has an ongoing grant from the Simons Heising Foundation.

Curriculum:

In general we do not anticipate any changes in Physics curriculum for the Physics major.

In PHYS 230 – Physical Reasoning and Scientific Writing, we continue to invite our colleague Jeffra Bussman from the Library faculty to help co-teach certain topics in this course. This has been a wonderful collaboration as she brings her expertise to help facilitate literature research aspects of this course. We hope to find a solution between the Library and he CSCI to have Dr. Busman co-teach this class in the future.

Students:

Our students are successfully finding positions in industry and continuing on to graduate programs. For instance, Austin Guest B.A. 2020 is currently enrolled in the Sacramento State Credential Program and is seeking to become a Physics high school teacher, and Michelle Berrios B.S, 2020 has been accepted to the Fresno State Physics Master's program.

Faculty:

Again in the AY 2019-20 we had 5 regular faculty (three Assistant Professors though now two Full Professors) and ten Lecturers working in the department by headcount. In the Fall semester 2019, only 26.7% of the classes (by WTU) were taught by Regular Faculty and in the Spring Semester that went up to only 43.8%. This low number of course taught by Regular Faculty was due in part to parental leave but also because numerous faculty in the Department of Physics are adept at grant-writing and have grant–paid release time.

For Fall 2019 and Spring 2020, there have been a myriad of occurrences that have left us short-staffed in regards to tenure-track faculty who typically teach the upper division core Physics major courses (Quantum Mechanics, Electromagnetism, Advanced Labs, etc.) Faculty were released from teaching due to grant buyout and other service opportunities. With the addition of Dr. Arran Phipps starting Fall 2020 that will bring the TT numbers up to six, however, Dr. Erik Helgren started serving as the Assistant Dean in the College of Science starting n the summer of 2020 which comes with partial course release which comes on top of the release for the chair duties in the department. As such there are still effectively then only five TT faculty in AY 2020-21 with two of those on sabbatical (Smith, full-year & Kimball, half-year). Thus in AY 2020-21 the department has two Assistant professors each with probationary faculty release time and a third just-tenured professor (with exceptional level of service to students release time) teaching in the department for the full 20-21 academic year.

Staff:

The Department of Physics shares an Office Manager (ASC I), Jacqueline Adams with the School of Engineering. Mohammad Ali serves as our Equipment Technician (IST II). Both of our staff members are extremely helpful and collegial, always going the extra mile to help our faculty and most importantly students. Mr. Ali has expressed the possibility of retiring in the coming years and it will be very difficult to replace him.

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

We are extremely constrained on how many Physics lab course we can offer as service to other departments and for GE B3 purposes.

Prior to the semester conversion, we had anticipated continued growth in the number of lab-based sections we would need to teach for the PHYS 125-126 Algebra-based Introductory Physics sequence as well as the PHYS 135-136-137 Calculus-based Introductory Physics Sequence. The anticipated extra enrollment for the 125-126 was expected from the new Health Science Environmental Safety concentration and the extra enrollment in 135-136-137 was expected from Computer Science majors being required to take part of the sequence as well as overall growth of the School of Engineering.

This anticipated growth would have left us very constrained on our ability to offer the accompanying lab sessions as we only have three lab classrooms for our department. Two of these are dedicated to our lower division labs, i.e., PHYS 125-126 and 135-136-137. The third lab classroom is dedicated to our upper division lab courses (lab equipment needs to remain set-up for the semester for some of the more complex experiments). As such the two lower division lab classrooms would have needed to be booked from Monday through Friday 8:00 a.m. until after 10 p.m. every day. (basically at capacity).

The enrollment increase in the PHYS 135-136-137 series has indeed been observed, but, as discussed below, the enrollment in the PHYS 125-126 did not occur and as such we have some flexibility in our lab classroom scheduling (which was needed this Fall term because we could not schedule Monday labs due to the three Monday holiday situation). However if the enrollments do bounce back or continue to increase, as expected, we will once again be space-constrained on how much we can offer/grow.

Assessment:

Due to COVID, assessment activities in our department were certainly affected, specifically because of the switch to online teaching which occurred in March 2020. We were not able to perform many of our in-class assessments because of the online modality. However, every effort

was made to continue to deliver pedagogical content that focused on helping students master the core learning objectives associated with each course.

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

We do not anticipate any major program modifications this year.

II. **<u>SUMMARY OF ASSESSMENT</u>** *(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)."

Physics B.S. Program Learning Objectives:

1. ***Explain*** *the fundamental principles of Physics and be able to apply these core ideas to analyze physical processes (ILO 1)*
2. ***Apply*** *quantitative reasoning and critical thinking to solve complex problems, both theoretical and experimental in nature; (ILO 1)*
3. ***Independently*** *learn new technical subjects and skills; (ILO 1)*
4. ***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)*
5. *Effectively discuss scientific ideas, both theoretical and experimental, to diverse audiences through written and oral presentations, both formal and informal; (ILO 2)*
6. *Work professionally, effectively, and inclusively as a member of diverse collaborations to solve problems. (ILO 3 & 4)*

Physics B.A. Program Learning Objectives:

1. *Describe the fundamental principles of Physics and be able to apply these core ideas to analyze physical processes; (ILO 1)*
2. *Use quantitative reasoning and critical thinking to solve problems, both theoretical and experimental in nature; (ILO 1)*
3. *Learn new technical subjects and skills; (ILO 1)*
4. *Construct, assess and troubleshoot experiments, quantitatively analyze the results using appropriate statistical procedures and tests of systematic errors, and draw meaningful conclusions; (ILO 1)*
5. *Effectively explain scientific ideas, both theoretical and experimental, to diverse audiences through written and oral presentations, both formal and informal; (ILO 2)*
6. *Work professionally, effectively, and inclusively as a member of diverse collaborations to solve problems. (ILO 3 & 4)*

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. 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.)

Assessment Plan for 2020-2021 Academic Year:

Assessment will be curtailed during the AY 21-22 due to COVID

C. Summary of Assessment Process

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

Instrument(s):

We utilize standardized tests (FCI, BEMA and ETS Physics Exam) 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 Force Concept Inventory (FCI) instrument 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. Moreover, the Brief Electricity and Magnetism Assessment (BEMA) assesses what students know about the most basic and central concepts of the calculus-based introductory E&M course. 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 and fair 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.

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.

Sampling Procedure: *The standardized testing assessments are given to the students in class with scantrons provided. 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 for the standardized tests, and recorded in rubrics launched from Blackboard LMS.*

Data Analysis: *Comparison of improvements in content retention and quality of research papers and presentation are completed from one year to the next year.*

D. Summary of Assessment Results

Main Findings: Assessment was not possible in AY 2019-20 due to COVID

Recommendations for Program Improvement: NA

Next Step(s) for Closing the Loop: NA

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Other Reflections: NA

E. Assessment Plans for Next Year (AY 2021-22)

- Assessment will be curtailed during the AY 21-22 due to COVID

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.

A. Discussion of Trends & Reflections

Notable Trends;

The number of Physics majors continues to be close to the national average for undergraduate Physics programs. The Physics major continues to be one of the smaller programs on campus. This is neither surprising nor unusual. In fact, in 2016, the average number of upper division students enrolled in Physics programs nationwide, including both B.S. and Ph.D. granting institutions was 34.8 (www.aip.org/statistics). This data is from the 684 institutions, of a total of 750, that reported their data. This average is considerably lower, only 21.3, when considering only the 508 B.S. granting institutions that reported their data. At CSUEB, in Fall 2019, according to CSUEB Program Enrollment dashboard, the number of Physics majors at CSUEB was 21, and we had 8 graduates from the department in AY 2019-20.

		Fall 2015		Fall 2016		Fall 2017		Fall 2018		Fall 2019	
		n	%	n	%	n	%	n	%	n	%
Undergraduate	Female	6	24%	6	19%	3	14%	3	14%	3	14%
	Male	19	76%	25	81%	19	86%	19	86%	18	86%
	Total	25	100%	31	100%	22	100%	22	100%	21	100%
Grand Total		25	100%	31	100%	22	100%	22	100%	21	100%

Table 1 – Number and percentage of Dept. of Physics number of majors by gender.

Physics: Race/Ethnicity

		Fall 2015		Fall 2016		Fall 2017		Fall 2018		Fall 2019	
		n	%	n	%	n	%	n	%	n	%
Undergraduate	Asian	1	4%	5	16%	3	14%	4	18%	4	19%
	Black/African American	2	8%	3	10%	1	5%	2	9%	2	10%
	International	2	8%	1	3%	1	5%	1	5%	1	5%
	Latinx	12	48%	11	35%	7	32%	6	27%	5	24%
	Multiple Races	2	8%	1	3%			1	5%	3	14%
	Unknown	2	8%	2	6%	2	9%	3	14%	3	14%
	White	4	16%	8	26%	8	36%	5	23%	3	14%

Table 2 – Number and Percentage of Dept. of Physics majors y race/ethnicity.

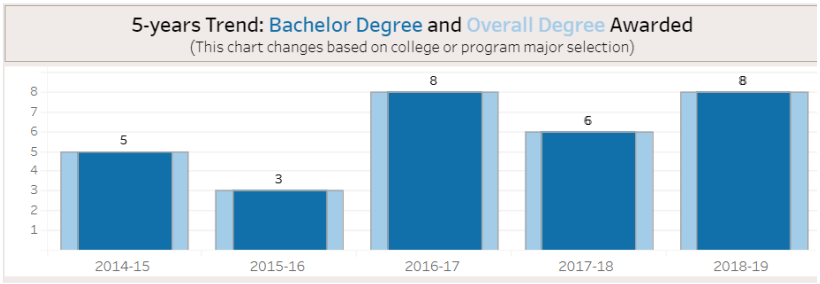


Table 3 – Number of Bachelor's degrees conferred annually in the Dept. of Physics from 2015- 2019

A notable trend in the Department of Physics has been a fall–off in the number of FTES (enrollment) and FTEF from the quarter system through the first two years of semesters.[3]

APR Coursework Data: Summary: Fall Term as of Census

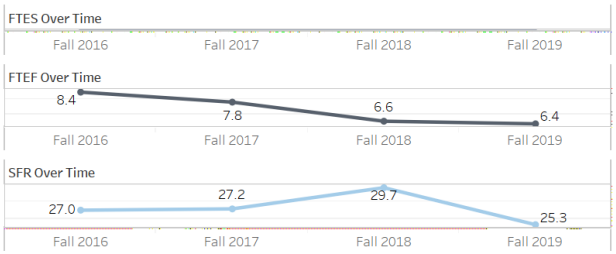
FTES, FTEF (instruction), and SFR of all state-side coursework

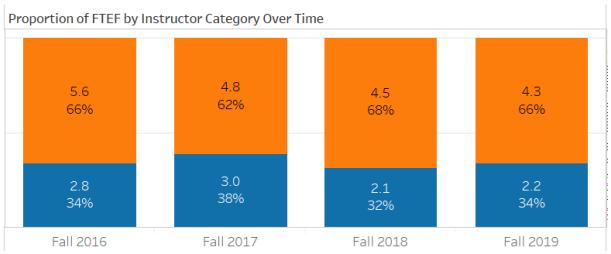
Term & Year

College	Department	Fall 2016 FTES	Fall 2016 FTEF	Fall 2016 SFR	Fall 2017 FTES	Fall 2017 FTEF	Fall 2017 SFR	Fall 2018 FTES	Fall 2018 FTEF	Fall 2018 SFR	Fall 2019 FTES	Fall 2019 FTEF	Fall 2019 SFR
CSCI	PHYS	227.6	8.4	27.0	211.8	7.8	27.2	196.0	6.6	29.7	162.4	6.4	25.3
	Total	227.6	8.4	27.0	211.8	7.8	27.2	196.0	6.6	29.7	162.4	6.4	25.3
Grand Total		227.6	8.4	27.0	211.8	7.8	27.2	196.0	6.6	29.7	162.4	6.4	25.3

Academic Ye.. Multiple values
Term Fall
Academic Org All
College All
Department PHYS
Instructor C.. All

Make a selection in the table above to filter charts further





Instructor Category
Non-tenured, Non-TT
Tenured, Tenure-track

APR Coursework Data: Subject and Course Level: Fall Term as of Census

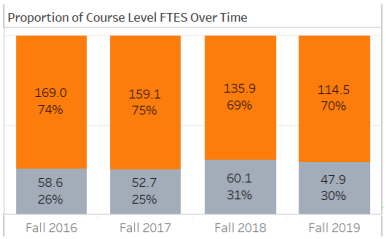
FTES, FTEF (instruction), and SFR of all state-side coursework

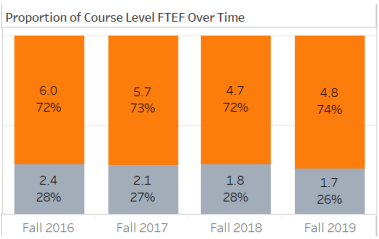
Term & Year

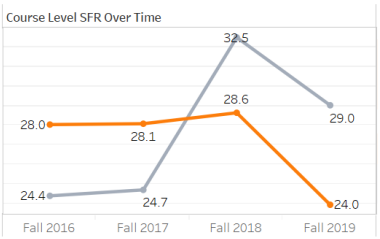
College	Department	Subject	Course Level	Fall 2016 FTES	Fall 2016 FTEF	Fall 2016 SFR	Fall 2017 FTES	Fall 2017 FTEF	Fall 2017 SFR	Fall 2018 FTES	Fall 2018 FTEF	Fall 2018 SFR	Fall 2019 FTES	Fall 2019 FTEF	Fall 2019 SFR
CSCI	PHYS	PHYS	Lower-division	169.0	6.0	28.0	159.1	5.7	28.1	135.9	4.7	28.6	114.5	4.8	24.0
			Upper-division	58.6	2.4	24.4	52.7	2.1	24.7	60.1	1.8	32.5	47.9	1.7	29.0
			Total	227.6	8.4	27.0	211.8	7.8	27.2	196.0	6.6	29.7	162.4	6.4	25.3
	Total			227.6	8.4	27.0	211.8	7.8	27.2	196.0	6.6	29.7	162.4	6.4	25.3
Grand Total				227.6	8.4	27.0	211.8	7.8	27.2	196.0	6.6	29.7	162.4	6.4	25.3

Academic Year
Multiple values
Term
Fall
Academic Org
All
College
All
Department
PHYS
Instructor Category
All

Make a selection in the table above to filter







Course Level
Lower-division
Upper-division

Table 4 - Dept. of Physics FTES, FTEF and SFR from 2016 - 2019

[3] Data from Pioneer Insights Dashboard – Academic Program Review (APR) for Physics, accessed Sept. 2020

Table 5, below, shows enrollment data for GE B1 courses (excluding the Algebra-based and Calculus based Introductory sequences PHYS 125 ad PHYS 135 which are also technically B1) offered by the department of Physics in the Fall term since 2015 showing the decreasing trend of total enrollment after the quarter to semester conversion. Underlined are course numbers, i.e., PHYS 1410 Physics for Future Leaders, PHYS 106 Physics for Future leaders (shown in the same column to indicate this is the equivalent course quarters to semesters). PHYS 1500 and PHYS 105 How Things Work, PHYS 107 Science of Energy (not offered in Fall terms under quarters), PHYS 1700 and PHYS 115 Elementary Physics and PHYS 1800 and PHYS 138 Astronomy.

	1410	1500		1700		1800	1800	Total
Fall 2015	30	89		24		50	51	244
	1410	1500		1700		1800	1800	
Fall 2016	26	82		25		35	56	224
	1410*	1500		1700		1800	1800	
Fall 2017	42	83		26		35	58	244
		105	107	115	115	138	138 (OL)	
Fall 2018		0	47	30	30	27	37	171
	106		107	115	115	138	138 (OL)	
Fall 2019	46		0	28	28	22	36	160
	106			115	115	138		
Fall 2020	16			24	23	20		83

Table 5 – Enrollment in Physics GE B1 courses for Fall 2015 – Fall 2020

Table 6, below, shows enrollment data for our Calculus-based Physics sequence PHYS 135-137 (PHYS 1001-2004 under quarters) has seen a steady increase through the quarter to semester conversion, likely due to the fact that this sequence is required by the growing Engineering and Computer Science programs.

	Course	Instructor	Enrollment
Fall 2015	PHYS 1001	Kimball	87
Fall 2016	PHYS 1001	Kimball	107
Fall 2017	PHYS 1001	Furniss	76
Fall 2018	PHYS 135	Kimball	97
Fall 2019	PHYS 135	Furniss	93
Fall 2020	PHYS 135	Furniss	168

Table 6 – Enrollment in Introductory Calculus-based Physics service course

Table 7, below, show the decrease in in the Algebra-based Physics sequence PHYS 125-126 .

	Total Enrollment	Kin. majors	Kin. Majors %
Fall 2015	261	60	23.0
Fall 2016	271	72	26.6
Fall 2017	280	76	27.1
Fall 2018	295	51	17.3
Fall 2019	194	32	16.5
Fall 2020	196	13	6.6

Table 7 – Total Enrollment, and statistics on Kinesiology majors in introductory Algebra-based Physics service course PHYS 125

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

The department is committed to growing the number of majors and continuing our efforts to increase the number of traditionally underserved student populations in Physics.

We are concerned about decrease in the enrollment in GE Physics courses. We have been in discussion with the director of General Education regarding changes in the way advisors will block enroll Freshmen in the Fall of 2020 as compared to 2019. We hope to learn what prevented the advisors from enrolling Freshmen into Physics classes. If however incoming native freshmen students were steered away from their B1 and B3 requirements in their first year, then perhaps we will see a natural rebound in the enrollments of these classes in this cohort's second year at CSUEB.

In the PHYS 125-126 sequence we are concerned about the drop in enrollment over the previous years. One area to note is that the new semester roadmap for Kinesiology students does not include Physics any more. Under quarters, students interested in earning a Kinesiology degree with the goal of applying for Physical Therapy or Occupational Therapy school, were guided into the algebra-based Physics sequence as this is a requirement for these graduate programs. It is clear that the number of Kinesiology majors in the PHYS 125-126 sequence is down, but that drop occurred even under the first semester under the new roadmap for Kinesiology, i.e., Fall 2018, with the large drop in total enrollment not coming until Fall 2019. Thus the reduced number of Kinesiology students is certainly not the only source of attrition in enrollment.
We have already reached out to the Chair of Kinesiology to discuss the possibility of including the Physics 125-126 sequence as part of the official roadmap for students interested in earning the Kinesiology degree who are looking towards a graduate degree in Allied Health. There are currently over 1200 Kinesiology majors here at CSUEB, though many are transfer students who would likely not need to take the course. However as the Chair indicated, likely 70% of Kinesiology majors express an interest in Allied Health graduate programs. As such the specific inclusion of the Physics sequence on the Kinesiology roadmap could result in a large increase in our introductory Physics enrollment.

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

1. Request for Tenure-Track Hires: provide evidence from trends provided

   We are not requesting a tenure-track hire for the upcoming academic cycle. As per our five-year plan, we had anticipated needing two new hires during the subsequent five years, i.e., 2018 – 2023, so we are happy to be half way there.

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 funding is used to pay for basic necessities in lab based sciences. We are encouraged that the administration acknowledges the higher cost of lab based curriculum and provides more funding to the college of Science on a per FTES basis due to the high proportion of laboratory based courses, and we hope that this continues into the future.

It is also strongly hoped for that the administration try to understand the lengths to which the Physics faculty and other faculty in the CSCI go in order to “make things work” in the outdated/inadequate Science building. Historically the Science building, along with A&E, was one of the first buildings on campus. The plans were borrowed from another, pre-approved building from another CSU. The building is ill-suited for having offices or research labs for the faculty. The heating is inadequate and there is no air conditioning. We would strongly encourage our administration to make upgrading the Science building, classrooms, offices and lab spaces and the accompanying infrastructure a high priority.