

# Assessment: Program Review & Planning



El Camino College  
Compton Center

## Compton: PRP (AA) - Div 1 Program: Astronomy/Physics

### Recommendation: COMPONENTS (DO NOT CHANGE)

Please click on the Updates tab to provide Updates to Components

#### *Program Review Components*

##### **A - Overview of Program** - Overview of the Program

- a) Narrative description of program:
- b) Program Degrees and/or Certificates:
- c) Program fulfillment of ECC mission:
- d) Program alignment with Strategic Initiatives:
- e) Status of Previous Recommendations:

(Active)

##### **B - Analysis of Research Data** - Analysis of Research Data

Provide and analyze the following statistics/data.

- a) Head count of students in the program
- b) Course grade distribution
- c) Success rates
- d) Retention rates
- e) Comparison of success and retention rates in face-to-face with distance education classes
- f) Enrollment statistics with section and seat counts and fill rates
- g) Scheduling of courses (day vs. night, days offered, and sequence)
- h) Improvement rates (if applicable)
- i) Additional data compiled by faculty
- j) Recommendations based on Analysis of Research Data

(Active)

##### **C - Curriculum** - Curriculum

Review and discuss the curriculum work done in the program during the past four years, including the following:

- a) Provide the curriculum course review timeline to ensure all courses are reviewed at least once every 6 years.
- b) Explain any course additions to current course offerings.

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- c) Explain any course deletions and inactivations from current course offerings.
- d) Describe the courses and number of sections offered in distance education. (Distance education includes hybrid classes.)
- e) Discuss how well the courses, degrees, or certificates meeting students' transfer or career training needs.
  - e.1) Have all courses that are required for your program's degrees and certificates been offered during the last two years? If not, has the program established a course offering cycle?
  - e.2) Are there any concerns regarding program courses and their articulation?
  - e.3) How many students earn degrees and/or certificates in your program? Do students take licensure exams? If so, what is the pass rate? If few students receive degrees or certificates or if few students pass the licensure exam, should the program's criteria or courses be re-examined? Set an attainable, measurable goal for future degrees, certificates, and/or licensure pass rates.
- f) Recommendations based on Curriculum

(Active)

## **D - Assessment and Student Learning Outcomes (SLOs) - Assessment and Student Learning Outcomes (SLOs)**

- a) Provide a copy of your alignment grid, which shows how course, program, and institutional learning outcomes are aligned.
- b) Provide a timeline for your course and program level SLO assessments.
- c) State the percent of course and program SLO statements that have been assessed.
- d) Summarize the SLO and PLO assessment results over the past four years and describe how those results led to improved student learning. Analyze and describe those changes. Provide specific examples.
- e) Determine and discuss the level your program has attained in the SLO Rubric in Appendix B. (Awareness, Developmental, Proficiency, or Sustainable Continuous Quality Improvement)
- f) Describe how you have improved your SLO process and engaged in dialogue about assessment results.
- g) Recommendations based on Assessment and Student Learning Outcomes (SLOs)

(Active)

## **E - Analysis of Student Feedback - Analysis of Student Feedback**

Provide a copy of any feedback reports generated by Institutional Research and Planning or your program. Review and discuss student feedback collected during the past four years including any surveys, focus groups, and/or interviews.

- a) Describe the results of relevant student feedback.
- b) Discuss the implications of the survey results for the program.
- c) Recommendations based on Analysis of Student Feedback

(Active)

## **F - Facilities & Equipment - Facilities and Equipment**

- a) Describe and assess the existing program facilities and equipment.
- b) Explain the immediate (1-2 years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.
- c) Explain the long-range (2-4+ years) needs related to facilities and equipment. Provide a cost estimate for each need and explain how it will help the program better meet its goals.
- d) Recommendations based on Facilities & Equipment

(Active)

## **G - Technology & Software - Technology and Software**

- a) Describe and assess the adequacy and currency of the technology and software used by the program.

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- b) Explain the immediate (1-2 years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.
- c) Explain the long-range (2-4+ years) needs related to technology and software. Provide a cost estimate for each need and explain how it will help the program better meet its goals.
- d) Recommendations based on Technology & Software

(Active)

## H - Staffing - Staffing

- a) Describe the program's current staffing, including faculty, administration, and classified staff.
- b) Explain and justify the program's staffing needs in the immediate (1-2 years) and long-term (2-4+ years). Provide cost estimates and explain how the position/s will help the program better meet its goals
- c) Recommendations based on Staffing

(Active)

## I - Direction & Vision - Direction and Vision

- a) Describe relevant changes within the academic field/industry. How will these changes impact the program in the next four years?
- b) Explain the direction and vision of the program and how you plan to achieve it.
- c) Recommendations based on Future Direction & Vision

(Active)

## Z - Review and Sign-Off - Enter in this section the name(s) of those who contributed to this program review.

- (Active)

## A - Overview of Program -

### Astronomy

The mission of the Astronomy Department at El Camino College Compton Community Educational Center (CEC) is to prepare students with knowledge and skills to pursue further education in the chemical, physical, and health sciences. Students learn to engage in scientific inquiry, problem solving, and are actively engaged in their learning. The goals and mission of the department match the college's mission, which is to offer a quality, comprehensive educational program and services to ensure the educational success of students from our diverse community.

The Astronomy Department offers three courses: Astronomy 20 – The Solar System, Astronomy 25 – Stars and Galaxies, and Astronomy 12 – Astronomy Laboratory.

All the courses offered at CEC fulfill the general education requirements for physical science with a laboratory and are transferable to the University of California and California State University Systems.

Students taking astronomy at CEC consists of an average of 55 % female, 36 % African American, and 54 % Latino. The majority of the students, 66 % are within the ages of 17-24, 14 % 25-29, and 11 % 30-39. About 55 % of the students are part-time students with 57 % taking their classes in the daytime. The Fall 2013 student profile at the Compton Educational Center were primarily female, 20-24 years old, Latino, high school graduates, attended class during the day and enrolled in fewer than six units.

As of February 2014, the Astronomy Department shares one full-time tenure track faculty with the Physics Department. There are no Adjunct members in the Astronomy Department. The Physics faculty actively participates in campus-wide and division

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committees and activities, such as the Honors program, Academic Senate, Compton Center Strategic Committee, the Accreditations Committee, meeting to strategize the improvement of teaching strategies, and effectively incorporate technology in the classroom. The Astronomy department also participates and will continue to participate in the assessment of Students Learning Objectives (SLOs) and Program Level Objectives (PLOs), as well as program review and program planning. The findings from the assessments of the SLOs and PLOs help the faculty to make changes to teaching strategies accordingly, in order to improve the students' learning. The Astronomy department continuously evaluates the curriculum and demand for courses through program review and planning to comply with the college's strategic initiatives C and E.

The Astronomy faculty at CEC engages students to actively participate in their learning by using a variety of instructional methods and services to promote student success and create a positive learning environment, as well as a sense of community. Our full-time faculty has completed the Faculty Inquiry Partnership Program (FIPP), On-Course Training, and regularly attends the American Association of Physics Teachers meetings. This information, especially that from Physics Education Research and NASA's Center for Astronomical Education (CAE), is discussed with adjuncts to improve educational effectiveness. For example, students participate in peer teaching, group presentations, and class activities; we minimize teacher-speaking times. The laboratory experiments are designed to be performed in pairs (or groups) as well as individually for the students to learn a sense of belonging and most importantly to learn how to work collaboratively.

## Physics

The mission of the Physics Department at El Camino College Compton Community Educational Center (CEC) is to prepare students with knowledge and skills to pursue further education in the chemical, physical, and health sciences. Students learn to engage in scientific inquiry, problem solving, and are actively engaged in their learning. The goals and mission of the department match the college's mission, which is to offer a quality, comprehensive educational program and services to ensure the educational success of students from our diverse community.

The Physics Department offers three types of courses:

- 1) For majors in Engineering, Physics, Chemistry and Mathematics, the Physics department offers four courses: Physics1A-Mechanics; Physics1B-Fluids, Heat, Sound; Physics1C-Electricity; and Physics 1D -Optics, Modern Physics. Of these only Physics1B has not been offered.
- 2) For pre-professionals, Architecture majors, Physical Therapy majors and others transferring to institutions that require algebra-based physics, the department offers Physics 2A and 2B. Physics 2A includes mechanics, fluids, heat and sound, and Physics 2B electricity, optics, and modern physics.
- 3) Physics 11 and Physics 12 are offered to meet requirements of transfer students in non-science majors. The Physics 3 sequence (for pre-professionals transferring to institutions that require two semesters of physics with calculus), and Physical Science 25 (for students preparing to teach at the elementary and middle school level) have not been offered.

All the courses offered at CEC fulfill the general education requirements for physical science with a laboratory and are transferable to the University of California and California State University Systems.

Students taking physics at CEC consists of an average of 30 % female, 18 % African American, and 43 % Latino. The majority of the students, 68 % are within the ages of 17-24, 21 % 25-29, and 7 % 30-39. About 81 % of the students are part-time students with 53 % taking their classes in the daytime. The Fall 2013 student profile at the Compton Educational Center were primarily female, 20-24 years old, Latino, high school graduates, attended class during the day and enrolled in fewer than six units.

As of February 2014, the Physics Department shares one full-time tenure track faculty with the Astronomy Department. There are two adjunct instructors in the Physics Department. The Physics faculty actively participates in campus-wide and division committees and activities, such as the Honors program, Academic Senate, Compton Center Strategic Committee, the Accreditations Committee, meeting to strategize the improvement of teaching strategies, and effectively incorporate technology in the classroom. The Physics department also participates and will continue to participate in the assessment of Students Learning Objectives (SLOs) and Program Level Objectives (PLOs), as well as program review and program planning. The findings from the assessments of the SLOs and PLOs help the faculty to make changes to teaching strategies accordingly, in order to improve the students' learning. The Physics department continuously evaluates the curriculum and demand for courses through program review and planning to comply with the college's strategic initiatives C and E.

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## **B - Analysis of Research Data -**

### Astronomy

#### 1. Head count of Students in the Program

The head count has been decreasing during the past four years, and has been independent of fall/spring semester. The head counts for the Fall and Spring semesters from 2010/2011 to 2013/2014 are tabulated below. It is interesting that the fall semester has typically fewer students than the spring. We also notice the sharp decrease in the number of students in spring 2014.

#### 2. Course Grade Distribution

The table below shows the grade distributions for all Astronomy classes from 2010 to 2013. The data shows that 82% of the students enrolled will pass with a letter grade 'C' or better from 2010/2011 to 2013/2014, not including the withdrawals ('W') or dropped ('DR') grades. There is a variation from 84% to 74%, but no statistically observable trends.

The following two charts show the grade distribution as a function of year and of course. Note that there are three courses that we are looking at: Astro-12 (lab), Astro-20 (Solar System), and Astro-25 (Stars and Galaxies). We note that the distribution of grades seems to be independent of year and of course. There is one exception, that of the lab class. Its grade distribution is different.

#### 3. Success Rates

The data in the table below shows that the success rate for the Astronomy classes at CEC is above the average college success rate. The success rate is defined as a student completing the course with grade of 'C' or better compared to the total number of grades; including those who withdrew or dropped the course after census date. Astronomy courses are thought to be easy, because of Astrology and people's interest, and because people think it is just learning about constellations. Unfortunately, many students find that their initial preconceptions are incorrect, and are not prepared for the level of effort to succeed. Success in astronomy is dependent on several factors, but depends strongly on the preparation before class. One main factor contributing to the low success rate is the lack of basic skills. In order to pass astronomy, students need to be able to read at a college level, have good comprehension and critical thinking skills, and apply basic math skills. From observations of several faculty members, many of the students have poor critical, comprehension and math skills. These comments are anecdotal though. It would be good to have real data.

Astronomy is also a very highly time dependent course. For example, the Astronomy lecture courses cover 14 chapters in a semester; therefore effective reading and comprehension skills are necessary. Success is also dependent on the preparation and review after each class meeting. Most of our students, 59 %, are part-time students who have other obligations; such as part-time or full-time jobs and family. Thus, it is hard for students to find the time to study after class. Instructors provide suggestions and resources to students to effectively study and set time to study, but unfortunately, many students do not take the time to figure out how to study astronomy effectively.

Another factor that many faculty members have observed over the years, is that about one-third of the students do not have the required textbooks or materials until the third week. The lack of studying materials places the students at a disadvantage because they fall two to three weeks behind and most spend a good part of the semester trying to catch up with the class. The lack of study materials and time makes catching up very difficult once a student has fallen behind. To mollify this issue, a two textbooks

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have been placed on reserved at the library, but this means that the student's schedule matches with the library schedule.

The department's success rate is above that of the college standard, but there has been a drop in the last year of measure. This change deserves watching. This could be due to the new faculty member having a more rigorous course. If the success rate takes into account only those students who received a C or better to the number of students enrolled at the end of the semester instead of the total number of students at census day, then the success rates are even higher (see table below).

These are very high numbers, but there is a decrease over the final year of measure. This could be due to the new faculty member having a more rigorous course. This change does bare watching.

To improve the success rate in Astronomy, it is important to provide the student resources such as in-person tutoring. The department needs to work with the Learning Resource Center to hire well-chosen tutors and SI coaches. In addition, the MESA facility should be more fully utilized. Finally, these comments will serve those students that spend there time on the Compton Campus. It is unclear whether many do, in fact, they may spend most of there time elsewhere.

## 4. Retention Rates

The retention rates from 2010 to 2014 are shown in the table below. The numbers are rather steady at 90%, with a drop in the last year of 15%. The drop is concerning though. This drop may be due to the fact that Astronomy courses are very demanding. Many of these introductory students do not have adequate study skills and do not perform well in science courses, forcing them to drop the course. In addition, many of the students work and do not have much of time to dedicate to their studies.

The instructors provide resources to struggling students but many do not have the time to study, attend office hours, or put into practice the advised study skills. One method of improving the retention rate should be to increase the tutoring resources and pursue online tutoring to especially assist those working students who cannot make it to school for tutoring services or the instructor's office hours. The same possible reasons for and recommendations for improving the success rates apply to retention rates.

## 6. Enrollment Statistics with Section and Seat Counts and Fill Rates

The program participation has been decreasing over the past 4 years. The headcount is shown in the table and graph below. Additionally, the graph below shows that even though the overall annual program participation decreased so did the number of sections offered (a decreased of 20%) due to budget cuts.

There is a constant demand for the astronomy courses, and it has been relatively steady for the past 4 years. The evidence is presented in the graph below; again these ratios are statistically limited. Additionally, the relatively stable value of the "Enrollment/Students" in the table above indicates that there is a constant steady supply of new students enrolled in astronomy classes. Since these courses are at the introductory level, there may be an opportunity here to provide a successful algebra-based astronomy or astrophysics course.

There has been a change in when the Astronomy courses are being offered. They have steadily changed from 60/40 daytime in 2010/2011 to nearly 50/50 during the 2013/2014-year.

## Physics

### 1. Head count of Students in the Program

The head count dramatically increased by 40% from 2010/2011 to 2011/2012, and decreased by the same amount in the 2012/2013 to 2013/2014 years. This increase was a year later than the campus-wide increase. It was most likely due to the partnership with El Camino College (ECC) gaining traction. The decrease is probably due to the retirement of one full-time instructor the installation of another, and a decrease in the number of classes offered in Spring 2014. The head counts for the Fall and Spring semesters from 2010/2011 to 2013/2014 are tabulated below.

### 2. Course Grade Distribution

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The table below shows the grade distributions for all Physics classes from 2010 to 2013. The data shows that 90% of the students enrolled will pass with a letter grade 'C' or better from 2010/2011 to 2013/2014, not including the withdrawals ('W') or dropped ('DR') grades. There is a variation from 85% to 95%, but no statistically observable trends.

The grade distribution is further broken down by course sequence for the 2012/2013 year. That is Physics 1A, 1B, 1C, and 1D are combined together and the Physics 11 and 12 are combined as well. This year was chosen because a full compliment of courses was offered. More than 85% of the students in both courses passed the course with a letter grade of 'C' or better. Out of 113, 97% of the students enrolled in the Physics 1 sequence after the withdrawal date earned a 'C' or better. Out of 76 students, 85% of those enrolled in Physics 11 or 12 after the withdrawal date earned a 'C' or better.

### 3. Success Rates

The data in the table below shows that the success rate for the Physics classes at CEC is above the average college success rate. The success rate is defined as a student completing the course with grade of 'C' or better compared to the total number of grades; including those who withdrew or dropped the course after census date. Physics courses are generally known to be the most demanding. Success in physics is dependent on several factors, but depends strongly on the preparation before class. One main factor contributing to the low success rate is the lack of basic skills. In order to pass physics, students need to be able to read at a college level, have good comprehension and critical thinking skills, and apply basic math skills. From observations of several faculty members, many of the students have poor critical, comprehension and math skills. These comments are anecdotal though. It would be good to have real data. For example, a claim can be made that the students in the Physics 1 sequence are better prepared. Therefore, they should show a markedly higher success rate than for Physics 11/12, which is the introductory course.

Physics is also a very highly time dependent course. For example, each course in the Physics 1 sequence is a 5-unit course, in which approximately 15 chapters are covered in a semester. Therefore, success is also dependent on the preparation and review after each class meeting. Most of our students, 75 %, are part-time students who have other obligations; such as part-time or full-time jobs and family. Thus, it is hard for students to find the time to study after class. Instructors provide suggestions and resources to students to effectively study and set time to study, but unfortunately, many students do not take the time to figure out how to study physics effectively.

Another factor that many faculty members have observed over the years, is that about one-third of the students do not have the required textbooks or materials until the third week. The lack of studying materials places the students at a disadvantage because they fall two to three weeks behind and most spend a good part of the semester trying to catch up with the class. The lack of study materials and time makes catching up very difficult once a student has fallen behind. To mollify this issue, a textbook has been placed on reserved at the library, but this means that the student's schedule matches with the library schedule.

The department's success rate is well above that of the college standard, but there has been a drop in the last year of measure. This change deserves watching. If the success rate takes into account only those students who received a C or better to the number of students enrolled at the end of the semester instead of the total number of students at census day, then the success rates are even higher (see table below).

These are very high numbers, but there is a decrease over the past years. The reason for the decrease is unknown, although a case can be made that these percentages are known only to 9%.

To improve the success rate in Physics, it is important to provide the student resources such as in-person tutoring. The department needs to work with the Learning Resource Center to hire well-chosen tutors and SI coaches. In addition, the MESA facility should be more fully utilized. Also, adjunct faculty should be more available to students by being required to hold office hours and they should be compensated. It should be noted that many of the adjunct faculty do currently hold unofficial office hours without any monetary compensation. Finally, these comments will serve those students that spend there time on the Compton Campus. It is unclear whether many do, in fact, they may spend most of there time elsewhere.

### 4. Retention Rates



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The retention rates from 2010 to 2014 are shown in the table below. The numbers are rather steady at 91%, with a drop in the last year of 5%. As noted throughout, these ratios are known to about 9%. The drop is concerning though. This drop may be due to the fact that Physics courses are very demanding, and that in the 2013/2014 year that the more committed students of the Physics 1 sequence were not included (because the course wasn't offered). Many of these introductory students do not have adequate study skills and do not perform well in science courses, forcing them to drop the course. In addition, many of the students work and do not have much of time to dedicate to their studies.

The instructors provide resources to struggling students but many do not have the time to study, attend office hours, or put into practice the advised study skills. One method of improving the retention rate should be to increase the tutoring resources and pursue online tutoring to especially assist those working students who cannot make it to school for tutoring services or the instructor's office hours. The same possible reasons for and recommendations for improving the success rates apply to retention rates.

## 6. Enrollment Statistics with Section and Seat Counts and Fill Rates

The program participation increased from 2010 to 2011, this increase was most likely due to the partnership with ECC. However, from 2013 to 2014, a 25 % decrease in the annual enrollment was observed perhaps due to the growth limits on state apportionment funding. The headcount is shown in the table and graph below. Additionally, the graph below shows that even though the overall annual program participation decreased so did the number of sections offered (a decreased of 20%) due to budget cuts.

There is a high demand for the physics courses, and it has been increasing for the past 4 years. The evidence is presented in the graph below, again these ratios are statistically limited. Additionally, the relatively stable value of the "Enrollment/Students" in the table above indicates that there is a constant steady supply of new students enrolled in physics classes.

Physics courses are offered both during the day and the evenings in equal amounts.  
(Active)

## C - Curriculum - Astronomy

The table below shows the correlation between the courses we are offering and when the course curriculum has been reviewed.

Course Number	Course Title	Course Review Date	Transferability
Astronomy 12	Laboratory for Introductory Astronomy	Fall 2013	Yes
Astronomy 20	The Solar System	Fall 2013	Yes
Astronomy 25	Stars and Galaxies	Fall 2014	Yes

We have not added any new courses.

The Astronomy department does not offer any distance education courses. It would be beneficial to pursue the possibility of hybrid and online courses. By offering a hybrid course, where the lecture is online and the laboratory and discussion hour is in-person, the department would be able to increase the number of courses and sections offered and better engage and service our students. The department has not researched whether other colleges have been successful with online Astronomy courses. The tenure-track instructor is currently getting certified for teaching online courses. This instructor has already been using various Learning Management Systems (Moodle, Etudes, and Blackboard).

## Physics

The table below shows the correlation between the courses we are offering and when the course curriculum has been reviewed.

Course Number	Course Title	Course Review Date	Transferability
Physics 11	Descriptive Introduction to Physics	Fall 2013	Yes
Physics 12	Laboratory for Introductory Physics	Fall 2013	Yes
Phys 1A	Mechanics of Solids	Fall 2013	Yes



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Phys 1B	Fluids, Heat and Sound	Fall 2014	Yes
Phys 1C	Electricity and Magnetism	Spring 2015	Yes
Phys 1D	Optics and Modern Physics	Spring 2015	Yes
Phys 2A	General Physics	March 2013	Yes
Phys 2B	General Physics	March 2013	Yes

We have not added any new courses.

The Physics department does not offer any distance education courses. It would be beneficial to pursue the possibility of hybrid and online courses. By offering a hybrid course, where the lecture is online and the laboratory and discussion hour is in-person, the department would be able to increase the number of courses and sections offered and better engage and service our students. The department has not researched whether other colleges have been successful with online Physics courses. The tenure-track instructor is currently getting certified for teaching online courses. This instructor has already been using various Learning Management Systems (Moodle, Etudes, and Blackboard).

Utilizing the data, the department offers an equal amount of physics courses for non-science majors, as well as those who will be majoring in Engineering, Physics, Chemistry and Mathematics. The data does not show that we offered one section each of the Physics 2 sequence during Summer 2015. These classes were full, and the students were successful.  
(Active)

## D - Assessment and Student Learning Outcomes (SLOs) - Astronomy

### A. SLO and PLO Alignment Grid

The Astronomy Department has three Student Learning Outcomes (SLOs) and Program Level Outcomes (PLOs) for most astronomy courses. There is one exception: Astronomy 12 has two SLOs, which are aligned with the Institutional Learning Outcomes (ILOs) as shown in the table below. The ILO, PLO, and SLO alignments below are from a document obtained from TracDat dated 30 September 2013.

The Grids are presented in the attachments

### B. SLO and PLO Timeline

The table below shows the SLO and PLO timeline for the coming cycle.

Cycle Year	Semester	SLO	PLO
Year 1 of 4	Fall 2014	Chem 1A, Chem 4, and Chem 20 – SLO #3 Lab Safety	TBD*
Year 2 of 4	Fall 2015	Chem 1A, Chem 4, and Chem 20 – SLO #2 Structural Representation	TBD
Year 3 of 4	Fall 2016	Chem 1A, Chem 4, and Chem 20 – SLO #1 Equation Writing	TBD

\*To be determined by the combined ECC and CEC Program Leads, which are to be aligned Fall 2014.

### C. SLO and PLO Assessment

All of the Astronomy courses have been assessed for all required SLOs. The department has continued to keep up-to-date with the changes and timelines set by the SLO and PLO committee. Standard SLO instruments have been created for each of the Astronomy classes.

The department is moving to giving the assessment at the beginning to obtain a class baseline measure. This measure is then compared to the result obtained at the end of the semester. The comparison between these two measurements will give us needed data to assess any improvements as we change instructional techniques and hardware.

Summary of SLO data goes here.

Overall, some of the faculty has expressed interest in incorporating more integrated classroom activities and Mastering

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Astronomy or similar programs for the students to do online homework and track their progress. We want the proficiency standard to be 70% and the SLO assessments will be carried out every semester to track the progress and any adjustments will be done to improve the students' learning.

## Physics

### A. SLO and PLO Alignment Grid

The Physics Department has three Student Learning Outcomes (SLOs) and Program Level Outcomes (PLOs) for every most physics courses. There are two exceptions: Physics 11 and Physics 12 have one SLO, which are aligned with the Institutional Learning Outcomes (ILOs) as shown in the table below. The ILO, PLO, and SLO alignments below are from a document obtained from TracDat dated 30 September 2013.

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Overall, some of the faculty has expressed interest in incorporating more integrated classroom activities and Mastering Physics or similar programs for the students to do online homework and track their progress. We want the proficiency standard to be 70% and the SLO assessments will be carried out every semester to track the progress and any adjustments will be done to improve the students' learning.

(Active)

## F - Facilities & Equipment - Astronomy

All of the Astronomy classes and laboratories are taught in one classroom. The department also has one room that serves as stockroom. Our room space is limited and will impede the growth of the department.

Our department has a number of facilities and equipment needs that are described below.

1. Conduct a thorough inventory of equipment in MS 126, MS 127, and the observatory. This inventory is mandatory before any request of significant hardware will be made.
2. One of the most pressing problems in our facility is the heating and cooling of the building. The HVAC in the MS building has always been a problem that needs to be resolved immediately, hopefully within a year. The temperature of the classrooms

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and offices are either too hot or too cold. This is an issue for students, especially for those classes that are more than two hours long, during exams and lab periods. Students constantly complain, and with good reason, because it is difficult to concentrate when they are sweating or cannot feel their fingers because of the extreme temperatures.

3. The janitorial services need improvement. The floors in the Physics area (classrooms and stockroom) are cleaned perhaps two to three times a semester and only after several emails and requests to the maintenance office and the janitors themselves. The classrooms become filthy. Students should not be expected to learn in such unsuitable conditions.

4. Maintaining and repairing existing laboratory equipment as needed due to continued use.

5. Updating laboratory equipment to that utilizing real-time computer control.

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All of the Physics classes and laboratories are taught in one classroom. The department also has one room that serves as stockroom. Our room space is limited and will impede the growth of the department.

Our department has a number of facilities and equipment needs that are described below.

6. Conduct a thorough inventory of equipment in MS 126, MS 127, and the observatory. This inventory is mandatory before any request of significant hardware will be made.

7. One of the most pressing problems in our facility is the heating and cooling of the building. The HVAC in the MS building has always been a problem that needs to be resolved immediately, hopefully within a year. The temperature of the classrooms and offices are either too hot or too cold. This is an issue for students, especially for those classes that are more than two hours long, during exams and lab periods. Students constantly complain, and with good reason, because it is difficult to concentrate when they are sweating or cannot feel their fingers because of the extreme temperatures.

8. The janitorial services need improvement. The floors in the Physics area (classrooms and stockroom) are cleaned perhaps two to three times a semester and only after several emails and requests to the maintenance office and the janitors themselves. The classrooms become filthy. Students should not be expected to learn in such unsuitable conditions.

9. Maintaining and repairing existing laboratory equipment as needed due to continued use.

10. Updating laboratory equipment to that utilizing real-time computer control.

(Active)

## G - Technology & Software - Astronomy

Typically the Astronomy faculty use a laptop (or desktop), a document camera, and projectors. Some of the instructors incorporate Etudes or websites for the students to access the class material. It would be beneficial if there were WiFi access in the MS building so the students can access the course material in class. Thus, an immediate need would be to have WiFi in the MS building.

We need to convert the Astronomy classrooms into Smart Classrooms. A multimedia control center is needed MS126. Many, if not all, of our instructors use computers and technology in lecture and lab. Currently, they spend a lot of their time setting up the projector and computers at the beginning of the class. Additionally, the projectors have a poor sound system and when the instructors show instructional videos in class, many of the students on the back cannot hear and miss important information. The multimedia control center will have a good sound system that can be clearly heard throughout the entire class. This is an immediate need of the department. (As of November 2015, a portion of the system has been installed).

## Physics

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(Active)

## H - Staffing - Astronomy

In the spring of 2014, the Astronomy department added a tenure-track faculty member bringing the number of total full-time tenure-track faculty to one. The previous tenure faculty member retired in the fall of 2013. Please note that this faculty member is shared with the Physics Department. There are no additional faculty members in the department. The department offered 3 different types of courses in 2013/2014 with eight.

There is one physical science technician responsible for assisting all physical science faculty, including the Chemistry, Physics, Astronomy, and Earth Science departments. With the increase in the courses being offered and the demand for the preparation of the materials and demonstrations for the upcoming courses the workload of the lab technician will increase. We believe a part-time lab technician will be needed for the projecting to demand and take care of the instruments and lab equipment.

There is no direct supervisor for the lab technician. The faculty and lab technician generally work well together, but there is no line of authority if there is a question regarding performance. The technician reports directly to the dean. This technician should be under direct supervision by someone with knowledge of day-to-day operations and performance.

## Physics

In the spring of 2014, the Physics department added a tenure-track faculty member bringing the number of total full-time tenure-track faculty to one. The previous tenure faculty member retired in the fall of 2013. Please note that this faculty member is shared with the Astronomy Department. There are a total of two adjunct faculty members serving Physics. The department offered five courses in 2013/2014 with eight sections of which the full-time faculty member taught three.

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(Active)

## I - Direction & Vision - Astronomy

The direction and vision of the Astronomy Department at El Camino College Compton Community Educational Center is to provide students with the foundation of physics that they need to their program of study and provide them with the best education possible. To achieve these goals, our department will continue to improve the current teaching methodologies and develop innovative methods to better equip our students with the knowledge and technology they may need to succeed. We would like the entire Astronomy faculty to incorporate more cooperative learning methods and innovative technology to teach our students not only physical knowledge but skills, which will help them, become better students and citizens.

There is a high demand for astronomy, not only in our campus, but nationwide. A physicist can fill any engineering position, as evidenced by the author of this report (he was a satellite system engineering for 20 years and holds a PhD in physics). We would like to expand our program and offer more STEM courses at CEC. Unfortunately, the lack of classroom and lab space hinders our growth. One possibility to overcome this difficulty is to develop hybrid and online courses, in which only a portion of the course is taught on-campus. There are some colleges, such as Los Angeles Valley College, that offer hybrid courses (Chem 4 and Chem 1A) and have been successful for several years. In addition, Citrus College has operated an Astronomy Course entirely online. We have yet to research these courses; we only know of their existence. However, our limited number of full-time faculty cannot be spared to pursue this option. The development and offering of a hybrid course to increase the courses and sections offered by the

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department is not our top priority at the moment.

## Physics

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(Active)

## Recommendation: Astronomy/Physics 2015 Program Review Recommendation 1

The department should advertise Astronomy & Physics Classes in posted notices around the CEC campus before the registration starts.

**Recommendation Status:** Not Started

**Implementation Timeline:** Future Direction & Vision or Program Improvement

**Input/Last Revised Date:** 08/22/2016

**Origin of Recommendation:** 2016-17

**Expense Category:** Other

**Program Rank:** 01

**Rationale & Expected Outcome:** Program classes are not filled due to student population not understanding 1) availability of classes, and 2) knowledge of course characteristics.

**Anticipated Cost:** 1000

**Primary SI Supporting Recommendation:** D - Community Responsiveness

**Any Impact On Other Programs, Areas, or Units?:** Yes

**List impacted areas and describe potential impact:** outreach

**Funding Status:** Not Funded

**Annual Evaluation Date:** 08/22/2016

**Annual Evaluation:** Extensive ads will get students to enroll in the Center's Astronomy/ Physics programs

## Recommendation: Astronomy/Physics 2015 Program Review Recommendation 2

Hire and train Astronomy/Physics Tutors

**Recommendation Status:** Not Started

**Implementation Timeline:** Analysis of Research Data

**Input/Last Revised Date:** 08/22/2016

**Origin of Recommendation:** 2016-17

**Expense Category:** Staffing

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**Program Rank:** 01

**Rationale & Expected Outcome:** Student retention and success rates are low in the beginning Astronomy and Physics classes. A student liaison between the instructor and the class will decrease the cycle time for lesson plan improvements.

**Anticipated Cost:** 2000

**Primary SI Supporting Recommendation:** B - Student Success & Support

**Any Impact On Other Programs, Areas, or Units?:** No

**Funding Status:** Not Funded

**Annual Evaluation Date:** 08/22/2016

**Annual Evaluation:** More qualified student tutors will help our students to succeed

## Recommendation: Astronomy/Physics 2015 Program Review Recommendation 3

Replace older or antiquated equipment with more modern equipment and obtain additional demonstration/lab equipment

**Recommendation Status:** Partially Completed

**Implementation Timeline:** Future Direction & Vision or Program Improvement

**Input/Last Revised Date:** 08/22/2016

**Origin of Recommendation:** 2016-17

**Expense Category:** Instructional Equipment

**Program Rank:** 01

**Rationale & Expected Outcome:** Current methodology for Astronomy/Physics instruction includes the need to provide demonstrations and laboratories. We expect improvements in retention and success rates, and higher enrollment.

**Anticipated Cost:** 10000

**Primary SI Supporting Recommendation:** A - Student Learning

**Any Impact On Other Programs, Areas, or Units?:** No

**Funding Status:** Partially Funded

**Annual Evaluation Date:** 08/22/2016

**Annual Evaluation:** Students now have modern equipment to work in the labs and we are seeing better retention rates in astronomy and physics

## Recommendation: Astronomy/Physics 2015 Program Review Recommendation 4

Maintain currency in field

**Recommendation Status:** Not Started

**Implementation Timeline:** Curriculum

**Input/Last Revised Date:** 08/22/2016

**Origin of Recommendation:** 2016-17

**Expense Category:** Other

**Program Rank:** 01

**Rationale & Expected Outcome:** Communication with others in the field (Astronomy/Physics and Astronomy/Physics Teaching) is imperative. Through these interactions improvements in pedagogy take place (including instruction methods, demonstrations, and laboratories).

**Anticipated Cost:** 5000

**Primary SI Supporting Recommendation:** E - Institutional Effectiveness

**Any Impact On Other Programs, Areas, or Units?:** No

**Funding Status:** Partially Funded

**Annual Evaluation Date:** 08/22/2016

**Annual Evaluation:** Instructor training and currency in the field will help pedagogy.

## Recommendation: Astronomy/Physics 2015 Program Review

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## Recommendation 5

Computerize laboratory data analysis

**Recommendation Status:** Not Started

**Implementation Timeline:** Future Direction & Vision or Program Improvement

**Input/Last Revised Date:** 08/22/2016

**Origin of Recommendation:** 2016-17

**Expense Category:** Instructional Equipment

**Program Rank:** 01

**Rationale & Expected Outcome:** Current collection and analysis of data is by hand. This severely limits the instruction of important topics like decision making and critical thinking.

**Anticipated Cost:** 5000

**Primary SI Supporting Recommendation:** A - Student Learning

**Any Impact On Other Programs, Areas, or Units?:** No

**Funding Status:** Not Funded

**Annual Evaluation Date:** 08/22/2016

**Annual Evaluation:** Computerized data collection and analysis is current methodology today. Students have to trained in the latest technology