ACADEMIC PROGRAM REVIEW

Physics, Astronomy, and Physical Science

GROSSMONT COLLEGE

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Revised November 8, 2017

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APPENDICES

SIGNATURE PAGE:

This program review report for 2013-2019 is respectfully submitted by the members of the Grossmont College Physics, Astronomy, and Physical Science Department.

_____
Brian Carter (Department Head)

_____
Phil Blanco

_____
Sébastien Cormier

_____
Brodney Fitzgerald

DEPARTMENT/PROGRAM
ACADEMIC PROGRAM REVIEW

SECTION 1 – OVERVIEW.
DEPARTMENT HISTORY & PREVIOUS PROGRAM REVIEW RECOMMENDATIONS

1.1 Introduce the self-study with a brief department history. Include changes in staffing, curriculum, facilities, etc. (You may wish to cut/paste your previous department history and then add to it). Additionally, please list degrees and certificates your department offers.

The Physics, Astronomy, and Physical Sciences department is a key part of the college's contributions to sending students into STEM since its courses are required for Associate and Associate Degrees for Transfer (ADT) in Chemistry, Earth Science, Biology, Oceanography, Computer Science, Geology, and Mathematics. Our department offers an Associate degree in Physics and an ADT in Physics.

The department currently consists of four full time faculty, one full time technician, and thirteen adjuncts (see the list below). Since the last program review we have had one retirement, Ross Cohen, and brought in two new full time hires Brodney Fitzgerald and Sébastien Cormier. The two new hires have brought the department back to the level from ten years ago.

The department has a long history of community outreach in astronomy via star parties for the public. Our ability to engage in astronomy outreach has recently been improved via new telescopes and a brand new portable planetarium. While we continue to offer astronomy events, our ability to do so has been hampered by the state of disrepair of the observatory and by insufficient full time staffing.

We have updated a small fraction of our physics lab equipment, such as wireless accelerometers, new optics benches and polarization equipment but are in dire need of new equipment for most of the rest of our labs. Some of the equipment has not been updated in decades and we are missing out on the opportunity to provide labs that take advantage of many of the new data collection techniques that have recently become widespread and much more affordable.

Since the last program review we have offered a new course PSC 120, Fundamentals in Scientific Computing, which is in demand for many of our students who are trying to transfer into many engineering programs. We are also in the process of creating a new transferrable electronics course, PSC 280, aimed at these same students.

In order to improve access for students taking the three calculus-based courses (PHYC 140/240/241) required for many of the degrees listed above we are currently working with to align them with Cuyamaca's similar courses. The new courses will be PHYC 201/202/203

Full Time Faculty
- Philip Blanco - Hired 2006
- Brian Carter - Hired 2007
- Brodney Fitzgerald - Hired 2016 (Part Time from 2005)
- Sébastien Cormier - Hired - 2016 (Part Time from 2015)

Full Time Technician
- David Duenas - Hired 1996

Part Time Faculty

- Rex Paris - Hired 2001
- Vesa Junkkarinen - Hired 2002
- Douglas Brownell - Hired 2006
- Tom Pickett - Hired 2017
- Matt Searle - Hired 2015
- Luke Cota - Hired 2015
- David Coleman – Hired 2015
- Cezarina Gramada - Hired 2005
- Ayax Ramirez – Hired 2016
- James Bruton Hire 2018
- Gur Windmiller – Hire 2015
- Thomas Nguyen – Hire 2018
- John Oakes (cross-department) – (part time in department since 2010)

1.2 Your last program review contains the most recent Academic Program Review Committee Recommendations for the program. Describe changes that have been made in the program in response to recommendations from the last review including any activity proposals funded and what the results were. (Be sure to use the committee recommendations and not your own). Include the recommendations from the last program review in this section.

Below is a bulleted list of recommendations from the last program review where we have taken action:

- Submit appropriate forms to the staffing committee for an additional full-time faculty member

  As per the recommendation, since the last program review we have applied for and been approved for two new full time faculty (and lost one to retirement). We are, however, still in the same understaffed situation that we were at the time of the last program review.

- Work with your dean to coordinate your needs with other departments' needs for rooms 34-105, 34-106, 34-171

  We are usually able to coordinate to get use of 34-105, 34-106, and 34-171 for our courses, but it is still a constant back and forth with other departments. The classrooms that are directly connected via back-door hallways to our demonstrations rooms should be more readily available for scheduling by our department.

- Work with other departments in your division and counseling to share information about student pathways so that students have a clear understanding of which course sequence to complete and departments can plan course offerings to best meet student needs.

  We continue to work with other departments to make sure our classes do not overlap so that students can complete their courses in a timely manner. We have worked with counselors on our courses to meet student demand.

- Seek out opportunities to enhance your cultural awareness such as attending professional development activities related to diversity, participating in student success discussions and initiatives and inviting leaders from Umoja, EOPS and other similar programs to attend department meeting sessions.

  We sent a member of our department, Sébastien Cormier, along with other members of the college to attend an equity conference organized by the Equity Academy at Skyline College. Attendees of the conference are currently working on presenting the information to the college, which will also be disseminated to the department.

- Identify and participate in formal collaboration projects such as: the student pathways project, one theme/one campus or other integrative learning initiatives that focus on student engagement and success

  Dr. Blanco started working with various students on Honors projects to give them an opportunity for hands on physics and/or astronomy research opportunity. He brought Dr. Cormier in to work on some of the honors projects and Dr. Cormier has since become the coordinator of the Honors program at Grossmont.

- Attend Technology for Teaching and Learning Committee (TTLC) meetings to participate in discussions regarding website and online teaching and consider appointment to the committee if there is an opening.

  Brian Carter was on the TTLC for a year and a half and voiced concerns about the website, Canvas, and software requests. The entire full-time faculty have been trained to teach online. Brian Carter, Philip Blanco, and Brodney Fitzgerald attended the Online Teaching Conference in the summers of 2015 and 2016 to further our knowledge on online teaching and to note the latest trends/software used for online teaching.

- Consider attending professional development activities that promote student success while maintaining your high standards.

  - Carter, Blanco, & Fitzgerald
    - Online Teaching Conference (2015, 2016)
  - Cormier
    - attended SCAAPT (Southern California American Association of Physics Teachers) workshop, (Fall 2019)
    - attended Cuyamaca Syllabus Design Workshop (Fall 2019)
  - Blanco & Fitzgerald
    - attended SOCAL AAPT teacher training meeting (2018)

  - Fitzgerald
    - took courses on Project Based Learning and Culturally Responsive Teaching

- Work with the dean to develop a strategy to secure a shared tech with other departments in the division

  We currently have no plans to have a shared tech with other departments since our department uses equipment that is strictly for our courses.

- Using the Course History Information Report, continue to submit curriculum modification proposals for those courses that have not been reviewed by the Curriculum Committee in more than four years or curriculum deletion forms for those courses that have not been offered in the last three years.

  Many of our courses are currently being reviewed and will be submitted in the Spring of 2020, including PHYC 140/240/241

- Use student-learning outcome data for continued course and program improvement.

  We continue to collect student learning outcome data and apply it whenever possible to improve our instruction.

SECTION 2 - CURRICULUM DEVELOPMENT AND ACADEMIC STANDARDS

To answer these questions, refer to your department's catalog descriptions from the most recent college catalog (see “Courses of Instruction” section. This is the blue section).
If your program has an Associate Degree or Certificate program, refer to the relevant pages from the catalog (see “Associate Degree” section. This is the yellow section).

2.1 Describe how your course offerings have changed since the last program review. Have you added or deleted courses since the last review? If so, why? Include new or deleted programs, degrees and certificates.

Since the last program review we have added new sections of many of our courses (PHYC 130/131/140/240/241) due to increased demand.

We have added a new Physical Science course PSC 120 – Scientific Computing (MATLAB) which is in demand for students who are transferring into many engineering programs.

We have also added a new Astronomy course ASTR 120 -- Solar System Astronomy which has been mostly filled every semester.

We are in the process of adding a new electronics course (PSC 280), also for students who are transferring into engineering.

We are in the process of updating our three calculus-based physics courses for science and engineering students (PHYC 140/240/241) to align them with Cuyamaca to give our students more options for completing their course requirements in a timely fashion.

We have started offering more courses online to meet demand. These courses include PSC 120, PSC 100, and AST 110.

2.2 Describe your department’s practice for determining that all course outlines reflect currency in the field, relevance to student needs, and current teaching practices.

We have started reviewing the outlines and will be bringing them to Curriculum Committee for updating in Spring 2020.

2.3 How does your department use student engagement strategies in the classroom? How are your faculty including current issues in course content? Consider environmental, societal, ethical, political, technological, and/or other issues when answering this question.

Our department owns a set of clickers (and laminated voting cards) that are used regularly in the classroom for interactive activities such as Think-Pair-Share type questions. Think-Pair-Share is a collaborative learning technique where students initially think about a problem by themselves and then

work collaboratively with other students to reach consensus on an answer. We continue to discuss current issues in our fields which is a very important factor in engaging our students and explaining how our subjects relate to everyday phenomenon. In some cases we will incorporate current events into our Physics problems (e.g. what is the escape velocity needed for a Tesla Dragon rocket to make it to outer space?).

2.4. What orientation do you give to new faculty (both full- and part-time), and how do you maintain dialogue within your department about curriculum and assessment? What strategies do you have in-place that ensure consistency in grading in multiple sections and across semesters (e.g., mastery level assessment, writing rubrics, and departmental determination of core areas which must be taught)? Consider department practices, academic standards, and curricular expectations (i.e. SLOs and teaching to course outlines)?

New faculty members meet with the dean and department chair upon hire. They are offered syllabi, course outlines, lecture materials, and sample exams as well as an office next to full time faculty. The department chair explains in detail the expectations of the faculty as well as those of the college. The new faculty member is then given a tour of network resources and a tour of the campus, pointing out important support offices. They are also informed which full time faculty member teaches the same courses and are introduced to them. Emails are sent for any student learning outcome assessments that may be required that term. The full time members of the department are also informed of the new members and are encouraged to be helpful whenever possible.

In order to maintain consistency from semester to semester and across sections instructors for the relevant sections work together. For example the two primary instructors of the PHYC 240 regularly discuss their curriculum and assessment techniques, collaborating to share ideas about assessment and making sure that the same rigor is applied across sections.

2.5 Referring to the Grade Distribution Summary graphs (see Appendix 1), comment on how your department patterns relate to the college, division and statewide patterns. For course-by-course graphs, provide an explanation for any courses with different grade/success patterns than others. This may relate to major's courses vs GE, first-year vs second-year or basic skills vs transfer. Please describe how the department handles any unusual grading patterns. If you have any information that allows calibration of your grading data to external standards (performance of your students on standardized tests or licensing exams, transfer and/or employment success) please provide those to us and explain the connection. [The Program Review Data Liaison can help you with this section and will be providing you with all required data.]

** CORMIER WHERE THE HELL IS THIS

2.6 If applicable, provide a comparison of the retention and success rates of distance education

(online) sections (including hybrid) and face-to-face sections. What are your department policies on course delivery method? Is there anything in the data that would prompt your department to make changes? (Required data will be provided by the Program Review Data Liaison – insert graph here).

Not applicable

2.7 If applicable, include the list of courses that have been formally articulated with high schools. Describe any articulation and/or curricular collaboration efforts with K-12 schools. (Contact the Dean of CTE if you have questions).

Not applicable

2.8 Please describe how the program ensures that articulations are current. Identify any areas concern or additional needs that your department has about articulation with four-year institutions.

Articulation is important for our students looking to transfer into engineering and science programs, mostly at San Diego State and UC schools. We regularly coordinate with the articulation officer to update articulation and monitor possible state requirement changes.

SECTION 3 – STUDENT LEARNING OUTCOMES (SLOs)

3.1 Describe any changes (e.g., addition/deletion of SLOs, postponement of assessments) your department has made to your SLO assessment cycle. Include a brief description of why these changes were necessary. **NOTE: Changes should include reassessment of SLOs requiring further attention.**

There were no additions or deletions of SLOs during our SLO assessment cycle. Many of our SLO assessments have been postponed, but we have made a plan to become current with our SLO assessments. For Astronomy 110 SLOs 1-4, we will need to assess one SLO each semester until Fall 2021 since we are extremely behind in assessment. For Physical Sciences 100 SLOs 1-3, we will need to assess one SLO each semester until Fall 2021 since we are extremely behind in assessment. For Physical Sciences 298 and 299 AB, we will postpone SLO assessment until we have students taking the course. For Physics 240 SLOs 1-6, we will assess the first 2 SLOs in Fall 2019 but the other 4 SLOs will need to be assessed once each semester until Fall 2021 since we are extremely behind in assessment.

3.2 Give examples of how your department/unit has used SLO assessment results to improve a course, course sequence, and/or program over this program review cycle. In your narrative, please pay particular attention to assessment of courses that directly lead to a certificate/ degree/transfer (e.g., English 120, Psychology 120) and/or constitute a high enrollment course. For help with this prompt, please see the chart on the following page:

We have discussed the results of our assessments that we have conducted and we have used them to improve our teaching (e.g. add more resources to Canvas, give more in class discussion/exercises/homework related to harder topics for students)

3.3 What resources (time, professional development, curriculum approval process, etc.) did you need to carry out these improvements? Please explain.

The main resource was time...discussion of any changes in the SLO questions for our lecture classes as well as conducting the same labs for SLO assessment.

3.4 What evidence did you collect to demonstrate that the planned improvements were successful? If you have yet to assess the improvements, what evidence do you plan to collect?

Once we collect our SLO data in the upcoming cycles, we will know whether our discussions and assessments were successful.

3.5 How will you use this evidence to ensure ongoing course/course sequence/program improvements are sustained?

Once we collect the evidence, we will plan to have a resource for all faculty to examine for our SLO assessments as well as taking a look at our data (hopefully a Canvas shell). Once we have a resource, then the faculty can meet to discuss changes/additions/subtractions to our assessments.

SECTION 4 - FACILITIES AND SCHEDULING

4.1 List the type of facility spaces your department/program utilizes for instruction. This can include on-campus, off-campus, and virtual.
For our department we use classrooms for our lecture classes, lab rooms for our lecture and lab classes, mobile planetarium for our Astronomy courses, the roof of the science building 34 for astronomy labs to use the telescopes, and our observatory for our Astronomy labs in the past and outreach.

4.2 Are the spaces listed in 4.1 adequate to meet the program's educational objectives?
Yes___ No__x_

- If you checked 'yes', please explain how your department/program utilizes facility space so your department can meet its educational objectives. Please provide an explanation of specific facility requirements of your program, and how those requirements are being met.

- If you checked 'no', please explain how your department/program is not meeting its facility space needs to adequately meet its educational objectives. Please provide an explanation of specific facility requirements of your program, and how those requirements are not being met.

The classroom space is currently adequate for our needs, but as demand goes up for our courses we will need more space for our bigger courses and double sections. Some of the rooms for our Physics classes are too small especially since the Physics 110 courses are becoming double sections.The lab rooms are too small for our 32 person lab classes, and also the amount of equipment that we currently have is not sufficient to satisfy our needs. The planetarium has to be set up in a place with a minimum amount of height and width clearance and the campus only has a few areas that we can set up (either the second floor of the 34 building which we have to reserve and ask permission from nursing, Griffin Gate [tight squeeze], the gym [have to reserve in advance], or as we currently do use the courtyard outside of building 34 [weather such as wind and rain will ruin the dome]). The roof for our telescope is shaky and when we observe through the telescopes the image always shakes so we cannot adequately take pictures of the night sky through the telescope. On our campus there is much light pollution from surrounding buildings and parking lots so we can only observe certain objects from our roof (e.g. Moon, planets, brightest stars). The observatory that is located behind the baseball field is in disrepair. We tried to use it for our star party/observing session, but it is not ADA accessible. Also we found rats, snakeskin, and termites inside the dome. The dome itself does not properly rotate, and we have no wifi or internet connection in case we wanted to view an object remotely.

4.3 What proactive steps have you taken with regards to facility and scheduling to improve the ability of your department to meet the educational objectives of your program and ensure that students can complete their program in a timely manner?

We have talked to various members in facilities about our observatory but to no avail. We make sure to schedule our classes near our equipment to meet the needs of our students.

4.4 Identify and explain additional needed technological and equipment resources that could further

Enhance student learning in these spaces.

We need Wifi/internet access in our renovated or new observatory (if we get the observatory approved). We also will need software updates for our planetarium software since we continue to use our planetarium for our classes and outreach. We need 3 new Dobsonian telescopes for our Astronomy 112 students. We need updated equipment for our Physics/Physical Sciences labs as well as virtual/computer labs for our Physics/Physical Sciences courses.

4.5 Are students trying to access your program impacted by the facility spaces listed in 4.1? Yes_x__ No___

- If you checked 'yes', please explain how students are being negatively impacted by unmet facility needs experienced in your department/program. Please provide some specific examples.
- If you checked 'no', please explain how your department/program is actively managing its facility space needs to meet its educational objectives and provide student access to your program. Please provide some specific examples.

Students are asking about the observatory and its functionality each semester. The observatory will help us to serve more students and encourage some to pursue a career in astronomy.

4.6 If applicable, please include any additional information you feel is important regarding facilities and scheduling that was not included above including non-classroom spaces such as offices, storage, preparation areas, open workspaces for students/tutoring, etc.

Our offices are adequate for now but we will need more space for a new full time faculty member. Our storage is overflowing with equipment, and we need more storage along with alarm protection for our expensive equipment. Our preparation areas for our labs are currently adequate. Our tutoring space and our workspaces in our Physical Sciences offices are adequate for our students.

SECTION 5 – STUDENT EQUITY AND SUCCESS

NOTE: See Appendix 2 for enrollment data; Appendix 3 for student success data.

5.1 What are the identifiable patterns with regards to overall trends in enrollments in your department? Explain what is causing these trends (e.g. campus conditions, department practices). Once you have identified and explained your enrollment patterns, then address what your department has done/is doing to address identified issues. Examples of any changes you made to manage enrollment are encouraged.

In addition, you should examine your enrollment data, disaggregated by gender, age and ethnicity. For any of these student groups in your department with enrollment data at lower or higher proportions than college-wide numbers, describe what factors you think is causing these patterns [Data and a summary of notable patterns will be provided by the Program Review Data Liaison].

Astronomy
Enrollment in astronomy has been consistent in the fall semesters and has had a minimal drop off in the spring semester.

Enrollment in astronomy of females in astronomy has seen an increase which is consistent with the increase in female enrollment collegewide.

Enrollment in astronomy by age is consistent with collegewide trends.

Enrollment in astronomy by ethnicity is consistent with collegewide trends

Physics
Physics Enrollment has seen a steady increase in both semesters over the past four years.

Enrollment in physics of females has seen a slightly upward trend but it still well below collegewide enrollment. Women are historically underrepresented Physics course enrollment of women is however following the upward national trend as described by the American Institute of Physics (https://www.aip.org/statistics/reports/women-physics-and-astronomy-2019) and the American Society for Engineering Education (https://www.asee.org/papers-and-publications/publications/college-profiles/15EngineeringbytheNumbersPart1.pdf)

Enrollment in physics by age skews towards an older population than the collegewide average.

Enrollment in physics by ethnicity is consistent with collegewide trends

Physical Science
There has been a downward trend in the Physical Science enrollment in the past four years

Enrollment in Physical Sciences by gender is consistent with collegewide trends.

Enrollment in Physical Sciences by age is consistent with collegewide trends.

Enrollment in Physical Sciences by ethnicity is consistent with collegewide trends.

5.2 Discuss trends in student success and retention overall in your department and explain these trends (e.g. campus conditions, department practices). Also examine the success and retention data disaggregated by gender, age and ethnicity. For any groups that have success rates in your department at lower or higher than college-wide describe what factors you think cause those patterns. Provide examples of any changes you made to improve student success/retention, especially for groups that have equity gaps. [Data and a summary of notable patterns will be provided by the Program Review Data Liaison]

Astronomy
Astronomy retention has remained remarkably consistent with Division, College, and state trends throughout the past five years.

Physics
Over the course of the program review time frame the physics success and retention rate has improved to become similar to Division, College, and State rates.

Physical Science
Physical Science retention has remained consistent with Division trends but remains cons retention has remained remarkably consistent with Division, College, and state trends throughout the past five years..

5.3 Describe specific examples of departmental or individual efforts, including instructional innovations and/or special projects, aimed at encouraging students to become actively engaged in the learning process in their classes.

We do honors projects with our students. Blanco does Simulations and Cormier & Blanco do Doulbe Star Research projects. **more?

5.4 Explain how the program incorporates opportunities for student engagement outside of class time and/or in collaboration with other departments (e.g. interdisciplinary course offerings, learning communities, internships, research projects, service learning, or participation in community events, tournaments, competitions, and fairs) to enhance student learning.

Students are informed of opportunities to apply for internship programs (e.g. NASA summer internship, summer research opportunities via UCSD, Research Experience for Undergraduates program)

5.5 If state or federal licensing/registration examinations govern the program, please provide data and comment on student success trends.

Does not apply

5.6 If your program offers a degree or certificate in the college catalog, explain the trends regarding number of students who earn these degrees and/or certificates, including any changes that you have made to increase awards. Insert the "Degrees and Certificates" data table in this section. [This data table will be provided to you by the Program Review Data Research Liaison.]

Award	13/14	14/15	15/16	16/17	17/18	Total
Biological Sciences AS	3	5	5	5	5	23
Chemistry COA	2	2	0	5	5	14
Chemistry AS	0	2	1	6	8	17
Exercise Science--Athletic Training AS	0	0	0	0	0	0
Exercise Science & Wellness AS	7	10	3	7	15	42
Exercise Science & Wellness COA	6	11	3	6	11	37
Geography AS	3	1	0	1	2	7
Geography AA-T	1	1	6	5	8	21
Geology-AS	1	0	1	1	0	3
Geology AS-T	1	1	1	2	1	6
Mathematics AS	25	36	22	26	28	137
Mathematics AS-T	22	35	29	36	55	177
Oceanography AS	0	1	0	0	0	1
Physics AS	0	9	5	5	8	27
Physics AS-T	3	10	15	10	24	62
University Studies--Science & Math	5	4	2	0	0	11
University Studies--Math, Nat. & Comp. Sci	111	119	122	100	145	597
General Studies--ESW	3	1	2	2	6	14
General Studies--Science & Quant. Reas.	58	55	36	45	62	256
MNSESW Total (Degrees & Certificates)	251	303	253	262	383	1452
College Total (Degrees & Certificates)	2870	3134	3170	3576	4101	16851

Over the past five years an average of 5.4 degrees have been awarded per year. The number per year is too small to see a statistically significant change in the trend.

The number of Physics AS-T degrees has increase significantly over the past five years, only 5 being awarded in 2013/14 and 24 degrees being awarded in 2017/18.

5.7 If you have any information on what students who major in your department go on to achieve after they leave Grossmont, please share that with us. For example, where do they transfer and do they graduate on time? What careers do they pursue? What are starting salaries in the field? Do you know if they go on to employment in their field and professional success? What impact did Grossmont have on their lives?

We do not have longitudinal data on student careers after they leave Grossmont. We are very interested in collecting this data in the future.

SECTION 6 - STUDENT SUPPORT AND CAMPUS RESOURCES

6.1 Are the college's student support services (Tutoring, Counseling, Health Center, Library, Financial Aid) adequate to meet your student's needs? Please elaborate on your answer.

The Tutoring Center has two Physics tutors, and we have tutoring in our Physics/Astronomy/Physical Science Computer lab...both are adequate for our needs. Counseling has been a big help directing students to our courses. The Health Center is more than adequate to meet the needs of our students who need their support services.The Library has a few of our books on reserve for those students who need to access the textbooks for our courses. Financial Aid has been more than adequate to meet the needs of our students.

6.2 What services do students in your department/program use most often or that make the most difference? Can you provide any examples where services have clearly improved student retention and success?

The Physical Sciences/Physics/Astronomy Tutoring in our computer lab gives the students a valuable resource in case our students cannot attend our office hours. They have a resource close to their Physical Sciences/Physics/Astronomy classrooms and lab rooms in case they need help. We have had reports from our students that our tutors have been extremely helpful as peers and have alleviated some of the apprehension of science classes.

6.3 Are college support services adequately supporting your faculty and staff? Consider the following support services: IT, Instructional Operations, Business Services, Printing, Bookstore, Maintenance, CAPS, and any other support services important to your faculty and staff.

IT has been helpful in installing software on our computers before the new system of requesting software was established. Now it will take longer to get the updates and programs that we need to operate our classes. IT also has been slow in our request for computer replacement (e.g. it took our department a year to get replacement laptops, a member of our department is still waiting for his hard drive to replace his old hard drive). Instructional Operations has been very helpful in helping us reserve rooms and space for our on campus outreach events. Business Services has always been extremely helpful with our faculty. Printing has been a valuable help for our needs (exams, handouts, flyers, etc.), and their department has always given us help/suggestions for our printing needs.The Bookstore has been a better resource than previous years due to the new website which makes it easier to order textbooks for our courses. Maintenance is hit or miss...we know that we need more staff in that area to help clean up around campus. We have a problem when it comes to cleaning up our area especially since we have outreach events in the courtyard near building 34. CAPS has been very quick to respond to our requests (e.g. opening doors, check security for our rooms, responding to a broken window in our department).

SECTION 7 – ON-CAMPUS/OFF-CAMPUS INVOLVEMENT

The first table you see in this section is INFORMATIONAL ONLY, so you can understand what type of information you should be providing for this section. The second table you will see is the suggested table format you should use to display your information for this section.

TABLE ONE: INFORMATIONAL ONLY – PLEASE ADDRESS THE CONTENT IN THIS TABLE

<table>
<tr><th>OFF CAMPUS</th><th>ON CAMPUS</th></tr>
<tr><td>Marketing
Flyers, brochures, booths, radio</td><td rowspan="2">Marketing
Flyers, brochures, booths, Summit newspaper</td></tr>
<tr><td rowspan="2">Discipline Specific activities
Conferences, Clubs/Organizations, Department Events, Licensing Meetings, Technical Reviews/peer reviewing manuscripts/textbooks and other discipline-specific volunteer activities, regional and state task forces</td></tr>
<tr><td>Campus Volunteerism
Involvement in college and other department’s activities (campus open houses, science fair, water project, helping out as a theater usher or at a sports team event)</td></tr>
<tr><td>Community Involvement
Advisory committees, serving in regional groups, K-12 outreach, Job Fairs, other college-related but not discipline-specific activities</td><td>Interdisciplinary Collaboration
Collaborating on shared events, cross-listed courses, working with campus student services, linked courses (sharing of expertise/resources between departments to benefit student success, such as guest lectures, shared lab activities, simulation or other special events)</td></tr>
<tr><td>Professional Development
Attendance, creation/presentation, grants, sabbaticals</td><td>Professional Development
Workshop Attendance, creation/presentation of professional development activities, grant-writing and sabbatical projects</td></tr>
</table>

Table two on the next page shows how you should organize your activity data. Complete this table with your commentary.

If you need assistance in creating a table, please contact the Program Review Chair. If you are using word, simply select ‘insert’ from the main menu, then table, and then select the number of columns and rows you want for your table.

TABLE TWO: OUR ON CAMPUS AND OFF CAMPUS ACTIVITY

Faculty	Activity/Committee	Year(s)	Value to Student Success
Philip Blanco	"NASA's Kepler Mission and the Search for Habitable Worlds" talk at AAPT Winter 2015 meeting with Bill Welsh, SDSU in Jan 2015	2015	Information was brought to the classroom
Philip Blanco	April 9 joint presentation with Craig Milgrim "Follow the Water: Searching for exoplanets with NASA's Kepler mission" as part of the one theme/one campus on water.	2015	Information was presented to our students in the classroom
Brodney Fitzgerald	Lunar Eclipse Viewing at Balboa Park	2015	Outreach opportunity
Brodney Fitzgerald and Brian Carter	New Horizons and Pluto talk at Grossmont College	2015	Outreach opportunity plus presentation to students and brought information to the classroom
Philip Blanco	"Satellite splat: exploring sticky collisions with a surface-launched projectile" talk, AAPT Summer 2016 meeting, Sacramento, CA.	2016	Outreach opportunity
Brian Carter, Philip Blanco, Sebastién Cormier, and Brodney Fitzgerald	Transit of Mercury	2016 and 2019	Outreach opportunity
Brodney Fitzgerald and Brian Carter	Juno and Jupiter talk	2016	Outreach opportunity
Philip Blanco	Fall 2017 Political Economy Week, Tues Oct 24, "Space Law and the Future" by Sagi Kfir, Esq., Chief Counsel for Deep Space Industries.	2017	Outreach opportunity
Brian Carter and Brodney	Julian Starfest	2017 and 2019	Outreach opportunity

Fitzgerald			
Brian Carter, Philip Blanco, Sebastién Cormier, and Brodney Fitzgerald	August 2017 Total Solar Eclipse in Idaho, Oregon (Citizen Cate for continuous movie of Sun), Tennessee, and California	2017	Outreach opportunity
Brian Carter, Philip Blanco, Sebastién Cormier, and Brodney Fitzgerald	Grossmont Open House	2016	Outreach opportunity
Philip Blanco	January 2018 “Habitable Exoplanets: Applying introductory physics to other worlds” talk at AAPT Winter 2018 meeting with Bill Welsh	2018	Outreach Opportunity
Philip Blanco	A joint event for Spring 2018 Political Economy Week, Wed 2018 April 18 at 2pm: "The Elephant in the Room: the story behind NASA’s Apollo program - Humankind’s greatest engineering achievement” by Francis French, Education Director of the San Diego Air and Space Museum.	2018	Outreach Opportunity
Brian Carter, Philip Blanco, Sebastién	Grossmont College Star Party (observation session with telescopes)	2018 and 2019	Outreach Opportunity

Cormier, and Brodney Fitzgerald			
Philip Blanco	July 26 public presentation at Coronado Public Library: "Return to the Moon - 50 Years From One Small Step"	2019	Outreach Opportunity
Brian Carter, Philip Blanco, Sebastién Cormier, and Brodney Fitzgerald	Planetarium shows at Grossmont College, Gage Elementary, Calvary Christian School, Science Fair, and for governing board August 2016	2016-2019	Outreach plus student involvement

7.1 Referring to the above table, what activities contributed most to student success?

Our planetarium shows help students to understand the Earth's daytime and nighttime sky motions along with Moon phases. Also the planetarium shows get students excited about the night sky. Also the Open House help students get a glimpse of what we do as scientists. Lastly our science talks help to show the community how important scientific discoveries are to the improvement of our everyday life.

7.2 Please provide an overall reflection on your department's activity displayed in your table.

We have conducted many outreach opportunities, and we are very proud that we have provided the students and community with an insight into the wonderful world of science. We would like to do more outreach opportunities if (a) we had another faculty member and (b) our observatory were safe/operational.

7.3 Are your overall faculty professional development needs sufficient to ensure students are successful in your program?

Yes__x__ No ____

If no, please describe what faculty professional development needs are not being met.

SECTION 8 – FISCAL & HUMAN RESOURCES

NOTE: All required data tables and graphs will be compiled and delivered to you by the Program Review Data Liaison.

Fiscal Resources

Atronomy/Physical Science/Physics (Combined Total)

	FA13	***FA14***	***FA15***	***FA16***	***FA17***
Earned Enroll	1,067	1,005	1,081	1,130	1,022
Max Enroll	1,124	1,116	1,312	1,664	1,505
% Fill	**94.9**	**90.1**	**82.4**	**67.9**	**67.9**
Earned WSCH	4194.0	4057.0	4387.8	4654.7	4350.2
Total FTEF	6.85	6.85	8.30	10.25	9.80
Earned WSCH/FTEF	**612.3**	**592.3**	**528.7**	**454.1**	**443.9**

	SP14	***SP15***	***SP16***	***SP17***	***SP18***
Earned Enroll	996	1,192	1,210	1,166	1,110
Max Enroll	1,072	1,370	1,536	1,760	1,614
% Fill	**92.9**	**87.0**	**78.8**	**66.3**	**68.8**
Earned WSCH	3868.2	4799.6	4876.5	4945.2	4776.0
Total FTEF	6.35	8.55	9.60	11.25	10.85
Earned WSCH/FTEF	**609.2**	**561.4**	**508.0**	**439.6**	**440.2**

	SU13	***SU14***	***SU15***	***SU16***	***SU17***
Earned Enroll	147	136	125	128	155
Max Enroll	164	196	178	178	260
% Fill	**89.6**	**69.4**	**70.2**	**71.9**	**59.6**
Earned WSCH	504.1	530.5	599.5	549.5	660.3
Total FTEF	0.90	1.25	1.40	1.40	1.95
Earned WSCH/FTEF	**560.2**	**424.4**	**428.2**	**392.5**	**338.6**

Astronomy

	FA13	*FA14*	*FA15*	*FA16*	*FA17*
Earned Enroll	530	447	520	533	486
Max Enroll	521	471	571	735	660
% Fill	**101.7**	**94.9**	**91.1**	**72.5**	**73.6**
Earned WSCH	1590.0	1370.8	1560.0	1612.8	1470.2
Total FTEF	2.05	1.85	2.25	2.75	2.55
Earned WSCH/FTEF	**775.6**	**741.0**	**693.3**	**586.5**	**576.5**

	SP14	*SP15*	*SP16*	*SP17*	*SP18*
Earned Enroll	522	600	595	531	483
Max Enroll	546	716	736	818	668
% Fill	**95.6**	**83.8**	**80.8**	**64.9**	**72.3**
Earned WSCH	1566.0	1794.1	1785.0	1593.0	1449.0
Total FTEF	2.25	3.05	2.85	3.20	2.60
Earned WSCH/FTEF	**696.0**	**588.2**	**626.3**	**497.8**	**557.3**

	SU13	*SU14*	*SU15*	*SU16*	*SU17*
Earned Enroll	66	57	61	61	61
Max Enroll	82	82	82	82	82
% Fill	**80.5**	**69.5**	**74.4**	**74.4**	**74.4**
Earned WSCH	181.0	156.3	167.3	172.5	167.3
Total FTEF	0.35	0.35	0.35	0.35	0.35
Earned WSCH/FTEF	**517.2**	**446.7**	**478.0**	**493.0**	**478.0**

Physical Science

	FA13	FA14	FA15	FA16	FA17
Earned Enroll	212	234	181	200	125
Max Enroll	251	293	293	417	279
% Fill	**84.5**	**79.9**	**61.8**	**48.0**	**44.8**
Earned WSCH	636.0	719.4	543.0	625.5	376.8
Total FTEF	0.95	1.15	1.15	1.90	1.15
Earned WSCH/FTEF	**669.5**	**625.6**	**472.2**	**329.2**	**327.7**

	SP14	SP15	SP16	SP17	SP18
Earned Enroll	194	194	198	166	151
Max Enroll	238	238	288	302	302
% Fill	**81.5**	**81.5**	**68.8**	**55.0**	**50.0**
Earned WSCH	611.2	618.8	594.0	528.0	468.0
Total FTEF	0.95	0.95	1.15	1.85	1.50
Earned WSCH/FTEF	**643.4**	**651.3**	**516.5**	**285.4**	**312.0**

	SU13	SU14	SU15	SU16	SU17
Earned Enroll	48	26	0	0	13
Max Enroll	50	50	0	0	50
% Fill	**96.0**	**52.0**	**N/A**	**N/A**	**26.0**
Earned WSCH	136.0	73.7	0	0	35.7
Total FTEF	0.20	0.20	0	0	0.20
Earned WSCH/FTEF	**680.2**	**368.5**	**N/A**	**N/A**	**178.3**

Physics					
	FA13	***FA14***	***FA15***	***FA16***	***FA17***
Earned Enroll	325	324	380	397	411
Max Enroll	352	352	448	512	566
% Fill	**92.3**	**92.0**	**84.8**	**77.5**	**72.6**
Earned WSCH	1968.0	1966.8	2284.8	2416.4	2503.2
Total FTEF	3.85	3.85	4.90	5.60	6.10
Earned WSCH/FTEF	**511.2**	**510.9**	**466.3**	**431.5**	**410.4**
	SP14	***SP15***	***SP16***	***SP17***	***SP18***
Earned Enroll	280	398	417	469	476
Max Enroll	288	416	512	640	644
% Fill	**97.2**	**95.7**	**81.4**	**73.3**	**73.9**
Earned WSCH	1691.0	2386.8	2497.5	2824.2	2859.0
Total FTEF	3.15	4.55	5.60	6.20	6.75
Earned WSCH/FTEF	**536.8**	**524.6**	**446.0**	**455.5**	**423.6**
	SU13	***SU14***	***SU15***	***SU16***	***SU17***
Earned Enroll	33	53	64	67	81
Max Enroll	32	64	96	96	128
% Fill	**103.1**	**82.8**	**66.7**	**69.8**	**63.3**
Earned WSCH	187.1	300.4	432.2	377.0	457.3
Total FTEF	0.35	0.70	1.05	1.05	1.40
Earned WSCH/FTEF	**534.5**	**429.2**	**411.6**	**359.0**	**326.7**

Refer to the Table provided that shows Enrollment, % Fill, Earned WSCH, FTEF and WSCH/FTEF to answer these questions. Data for Fall, Spring and Summer semesters are provided separately.

8.1 Describe any patterns in enrollment; maximum enrolment and % fill in the program since the last program review. What are typical section maximum sizes (capacity) for your courses and what dictates those caps? Have you changed the number of sections offered and/or section sizes in response to changes in demand? If so, what effect has it had?

Our typical section maximum sizes are 32 students which is the class size maximum allowed by our most commonly used classrooms. We occasionally do double sections with a total maximum of 50 students for courses with a high enough demand.

When student demand increase at the start of the program review time-frame we added extra sections to meet the demand. This demand has been reduced slightly in the past year which lead to a lower number of sections being offered.

8.2 Describe and explain any patterns in Earned WSCH, FTEF and Earned WSCH/FTEF since the last program review. Please explain changes in FTEF due to changes in faculty staffing levels. For courses/sections with low Earned WSCH/FTEF explain their importance in the program and measures the department/program has taken/plans to take to improve efficiency and/or balance low and high efficiency offerings and/or maximize course % fill.

There has been a downward trend in Earned WSCH/FTEF over the past five years for Astronomy, Physical Science, AND Physics for both Fall and Spring Semesters. Demand for this department's courses has mostly increased over the past five years and the full-time staffing has not increased, causing an increase in FTEF and a strain on full-time faculty.

8.3. For money that you get from the college and/or from Perkins funds as part of your budget, is this amount adequate? What is this money used for to operate your department? If it is not adequate, please explain how additional funds would be used to improve student learning and success.

The money that we receive from the college is not adequate to fulfill the needs of our department. We hardly have enough money for department supplies (e.g. printer cartridges) and to replace broken/worn out equipment. In order for students to succeed in our courses we need to have functional equipment and enough equipment to run a productive lab. Also the college does not provide an easy way to conduct any outreach outside of our campus...there are many forms to sign and permissions that faculty need to receive in order to bring our mobile planetarium to a local elementary school.

8.4 If your program has received any financial support or subsidy outside of the college budget process (grants, awards, donations), explain where these funds are from, how they are used, and any other relevant information such as whether they are on-going or one-time.

Does not apply

Human Resources

Atronomy/Physical Science/Physics (Combined Total)					
	FA13	***FA14***	***FA15***	***FA16***	***FA17***
FT Faculty Count	3	3	2	4	4
PT Faculty Count	13	14	21	16	17
Full-Time FTEF	2.35	2.35	1.45	3.51	3.25
X-Pay FTEF	0.55	0.55	0.60	1.00	1.35
Part-Time FTEF	3.95	3.95	6.25	5.74	5.20
Total FTEF	6.85	6.85	8.30	10.25	9.80
FT Percent	**42.3%**	**42.3%**	**24.7%**	**44.0%**	**46.9%**
Permanent RT	0.383	0.383	0.450	0.441	0.441
Temporary RT			0.169	0.150	0.250

Astronomy					
	FA13	***FA14***	***FA15***	***FA16***	***FA17***
FT Faculty Count	2	2	2	3	3
PT Faculty Count	5	4	6	3	3
Full-Time FTEF	0.95	0.95	0.40	1.45	1.05
X-Pay FTEF	0	0	0.20	0.40	0.60
Part-Time FTEF	1.10	0.90	1.65	0.90	0.90
Total FTEF	2.05	1.85	2.25	2.75	2.55
FT Percent	**46.3%**	**51.4%**	**26.7%**	**67.3%**	**64.7%**

Physical Science

	FA13	FA14	FA15	FA16	FA17
FT Faculty Count	2*	2*	2*	4*	2
PT Faculty Count	2	3	4	4	4
Full-Time FTEF	0.35	0.35	0	0.35	0
X-Pay FTEF	0.20	0.20	0.40	0.60	0.40
Part-Time FTEF	0.40	0.60	0.75	0.95	0.75
Total FTEF	0.95	1.15	1.15	1.90	1.15
FT Percent	**57.9%**	**47.8%**	**34.8%**	**50.0%**	**34.8%**

***Includes J. Oakes, FT in Chemisry**

Physics

	FA13	FA14	FA15	FA16	FA17
FT Faculty Count	3	3	2	4	3
PT Faculty Count	6	7	11	9	10
Full-Time FTEF	1.05	1.05	1.05	1.71	2.20
X-Pay FTEF	0.35	0.35	0	0	0.35
Part-Time FTEF	2.45	2.45	3.85	3.89	3.55
Total FTEF	3.85	3.85	4.90	5.60	6.10
FT Percent	**36.4%**	**36.4%**	**21.4%**	**30.5%**	**41.8%**

NOTE: Please refer to the table provided by the Program Review Data Liaison to answer the following questions.

8.5 Describe the roles and responsibilities of full-time versus part-time faculty in your department. If any trends or changes are apparent in the past six years, please explain the reasons for them.

Formal meetings are held during Staff Development Week and at the conclusion of the semester, and more frequently when important issues arise. We also are able to have informal meetings in passing, or by email throughout the semester when less pressing issues come up. Occasionally non-critical informal voting is required (rock paper scissors), and formally either by poll or facilitated by the Dean when anonymity is desired.

8.6 Are the current levels of staffing of faculty adequate? Discuss part-time vs. full-time ratios and issues surrounding the availability of part-time instructors as well as duties and responsibilities of full-time faculty members that influence their loads (such as reassigned time & overload).

The increased demand for new sections along with no increase in full-time staffing has put a bigger strain on our ability to find part-time staffing. To add to this strain we have had problems with some of our part-timers that are teaching our courses (e.g. leaving mid semester, agreeing to teach a course and then quitting weeks before the course starts). Part of the difficulty in finding properly qualified part-timers is that the qualified teachers either go to a college that pays more money or apply to a college

who sends out an announcement of a full-time position before Grossmont does. This process can be frustrating, but with a full-time position we can get closer to the school's average of 50% full-time faculty members for our department.

8.7 If staffing levels are not adequate, give a justification of your request for increased Full Time faculty based on how this position would contribute to basic department function and/or the success, retention and engagement of students in the program.

We need more full-time faculty to meet the increasing demands of our department. In order for our department to grow, we need to have more outreach opportunities where students and the community get a chance to know about the wonders of science.

8.8 In the table below, list non-faculty positions that are responsible to your program (by title rather than by individual name). This list should include classified staff as well as work study and student workers.

Indicate the FTE/hours and where funding comes from for these positions. Add or delete rows to the table as needed. If you have questions on how to complete this table, please contact the Program Review Committee Chair.

Position	**Funding**	**FTE/Hours**					
		YR 1	**YR 2**	**YR 3**	**YR 4**	**YR 5**	**YR 6**
Technician	Departmental Budget	1	1	1	1	1	1
Student Workers	Federal Work Study	.3	.3	.5	.3	.3	.5

8.8 Briefly describe the duties for each position. Include a discussion of any changes in terms of non-faculty staffing and describe the impact on basic department function and/or the success of students in the program. Are current staffing levels adequate in non-faculty positions? If not, give a justification of your request for increased resources.

Technician

- Organize, coordinate and schedule the use of physics, astronomy, and physical science laboratories and specialized equipment and materials used in lab set-ups and demonstrations.
- Operate a wide variety of specialized equipment including telescopes, lasers, testing and measurement devices, chemical instruments, microscopes, audio-visual and other electronic, electrical and mechanical devices.
- Organize and direct the operation and maintenance of stockroom and preparation areas to ensure efficient lab operations.
- Isolate and diagnose equipment malfunctions, and determine necessary repairs.
- Interpret circuit schematics and perform repairs on sophisticated electronic equipment such as oscilloscopes,oscillators, generators, power supplies, Geiger counters, multimeters, lasers and microwave equipment.

- Design and implement modifications to equipment to restore operation and improve performance and reliability.
- Design and implement circuit modifications to improve performance of electronic circuits.
- Use hand tools for soldering, welding, tapping threads, cutting of glass and plastic.
- Use power tools including the table saw, metal lathe, drill press and routers for precision cutting of laboratory materials.
- Perform scheduled preventive maintenance on electronic, electrical, and optical equipment including lubricating, calibrating, aligning and replacing defective parts.
- Train and provide work direction to students and staff.
- Prepare the annual department budget; research budget requests; monitor expenditures; request budget transfers as necessary.
- Prepare and maintain a variety of computerized records and reports related to the maintenance and repair of equipment; maintain computerized inventory of all department equipment and reports related to budget and expenditures, and laboratory operations.
- Communicate with college and district staff to exchange information, resolve issue and discuss supply and equipment requirements.
- Communicate with vendors and manufacturers regarding parts, pricing, purchases and product information; negotiate prices.
- Maintain and operate the college observatory, which includes a computerized telescope along with other telescopes, solar filters and a variety of eyepieces.
- Mix chemicals, produce and develop 3-D holograms using laser technology.
- Maintain laboratory

Student Worker

- Assist technician in
    - setting up labs
    - putting away lab equipment

SECTION 9 – SUMMARY AND RECOMMENDATIONS

9.1 Summarize program strengths in terms of:

- Outreach - students enjoy our outreach programs as well as the faculty that attend the programs, opportunities for the community to express their interest in science as well as their questions on science,
- Engagement - students enjoy our classroom engagement strategies such as Think-Pair-Share based on feedback from evaluations, engagement/discussions during class allow students to learn about one another and to eventually form study groups,
- Retention - retention rates are steady,

9..2 Summarize program weaknesses in terms of:

- Outreach - we would conduct more outreach opportunities if we had another full time faculty member,
- Engagement - we need to add more engagement exercises/discussions to our courses,
- Retention - N/A

9.3 Describe any concerns that may affect the program before the next review cycle such as retirements, decreases/increases in full or part time instructors, addition of new programs, external changes, funding issues etc.
Decrease in part time instructor pool due to upcoming physics positions at other colleges
Will observatory be funded?
Will the planetarium be updated/kept up to date?
Will the department have enough funds to support our students?
Will the department have enough full-time faculty to support our students?
Will Astronomy be able to offer an Associate's Degree for Transfer?

9.4 Make a rank ordered list of program recommendations for the next six-year cycle based on the College's new Strategic Plan which includes outreach, engagement, and retention.

** Don't know what to put here. This?**

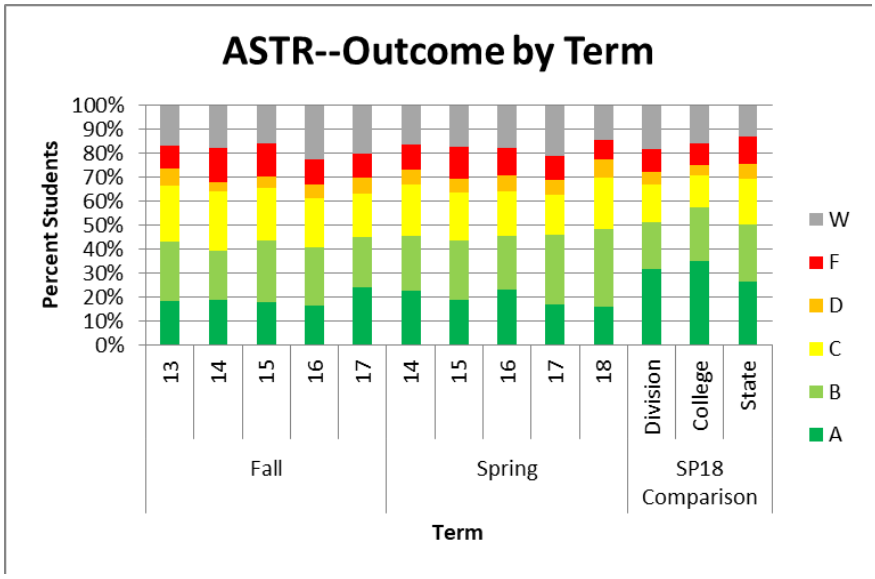
- Hire at least one additional faculty to relieve the overworked full time faculty
- Continue to seek funding for updating our out-of-date lab equipment
- Continue to increase student success
- Continue to try to reduce equity gaps
- Recruit more students in the Physics degrees

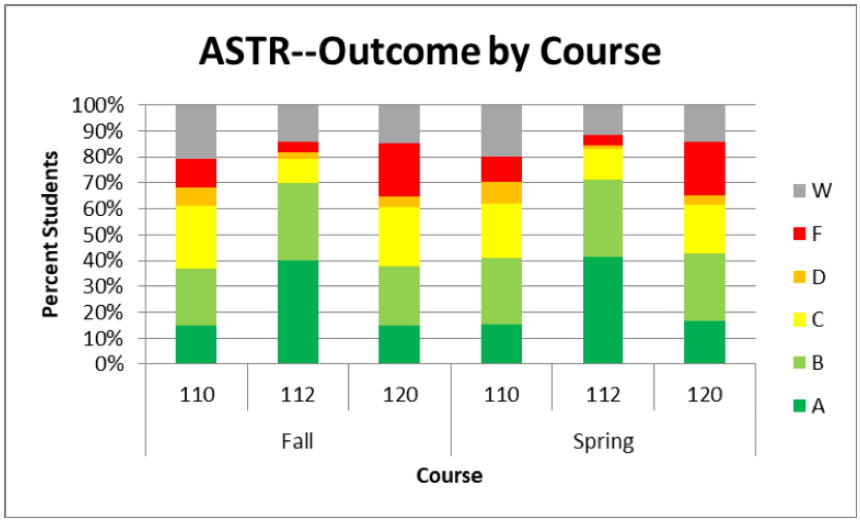
APPENDICES

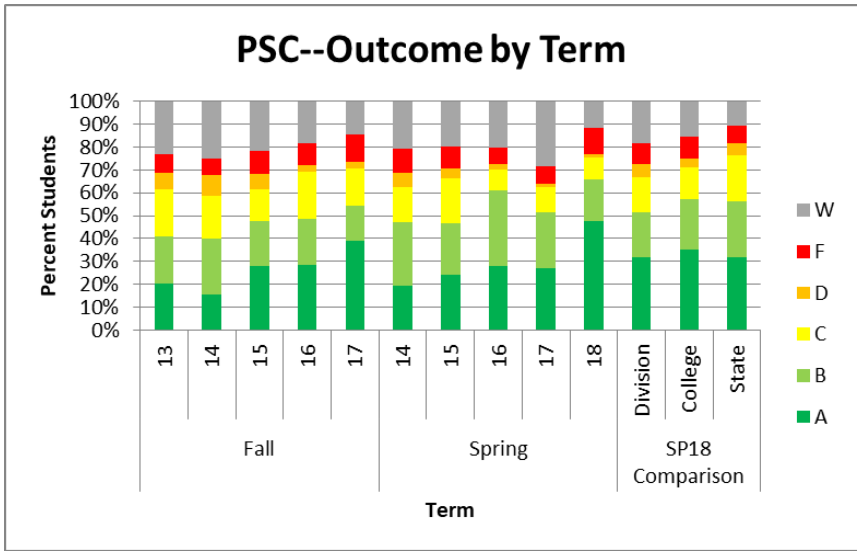
Please follow these instructions when gathering appendices information.

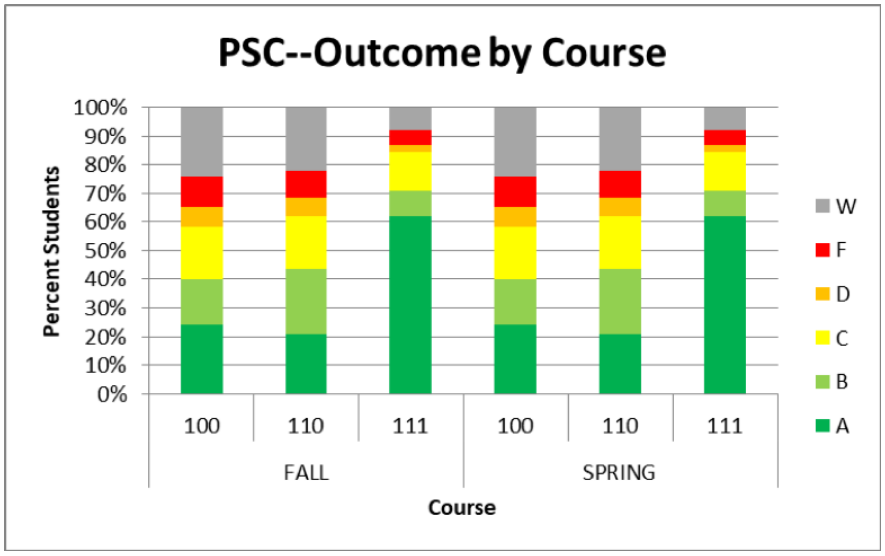
Please place tabs in front of each appendix with the appendix # and title. Please paginate the appendix as well, continuing the page count from the rest of the report.

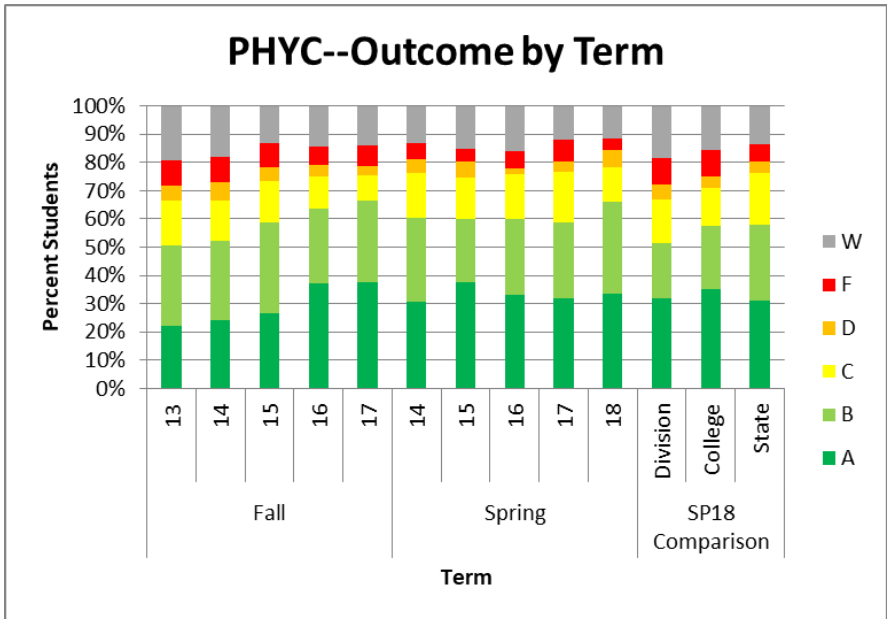
1. Grade Distribution Summary

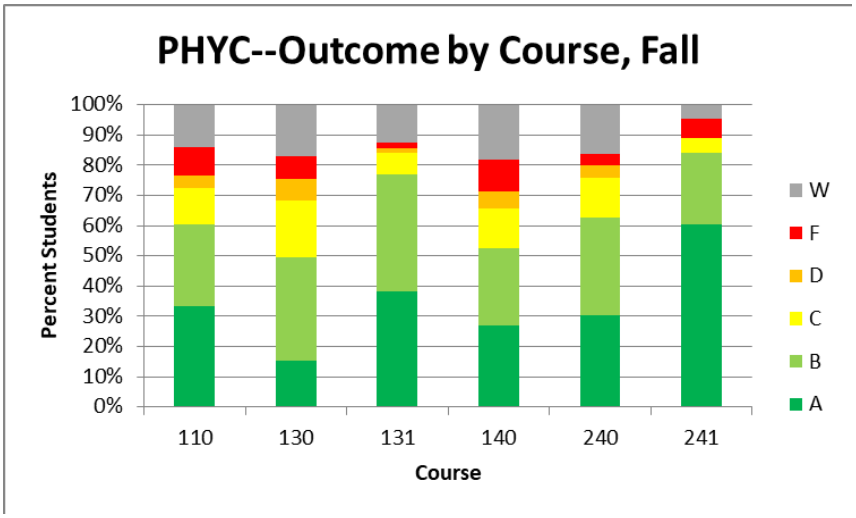





PSC--Outcome by Term
Percent Students
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
13
14
15
16
17
14
15
16
17
18
Division
College
State
Fall
Spring
SP18 Comparison
Term
W
F
D
C
B
A

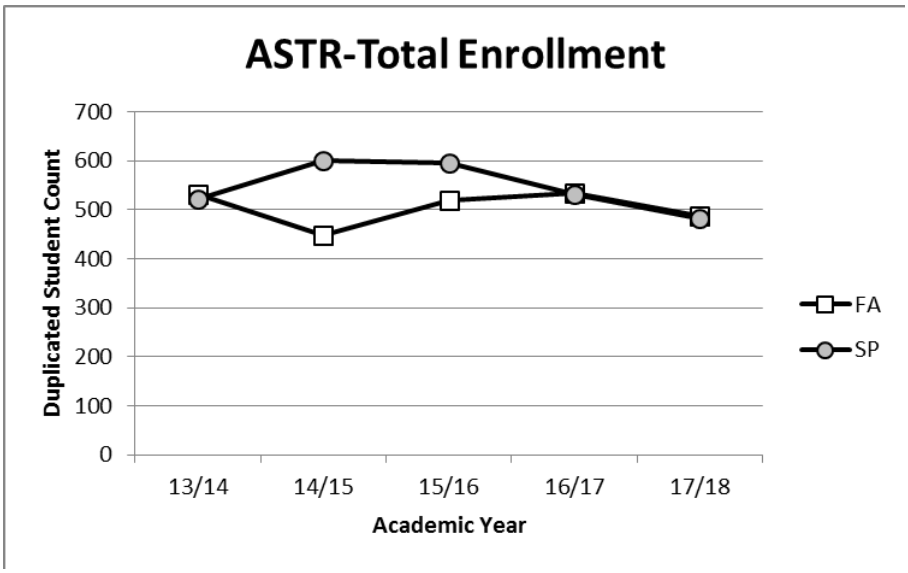

PSC--Outcome by Course
Percent Students
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
100
110
111
100
110
111
FALL
SPRING
Course
W
F
D
C
B
A

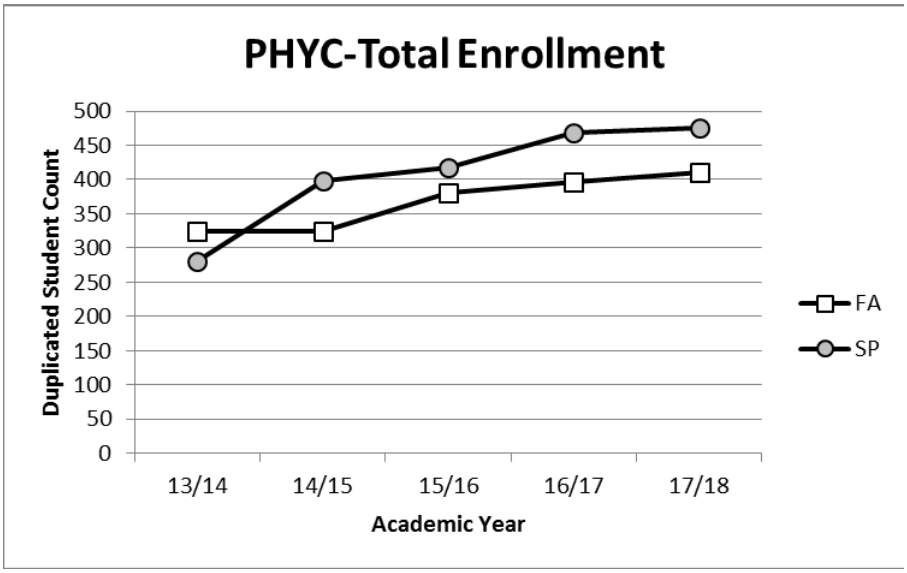

PHYC--Outcome by Term
Percent Students
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
13
14
15
16
17
14
15
16
17
18
Division
College
State
Fall
Spring
SP18 Comparison
Term
W
F
D
C
B
A

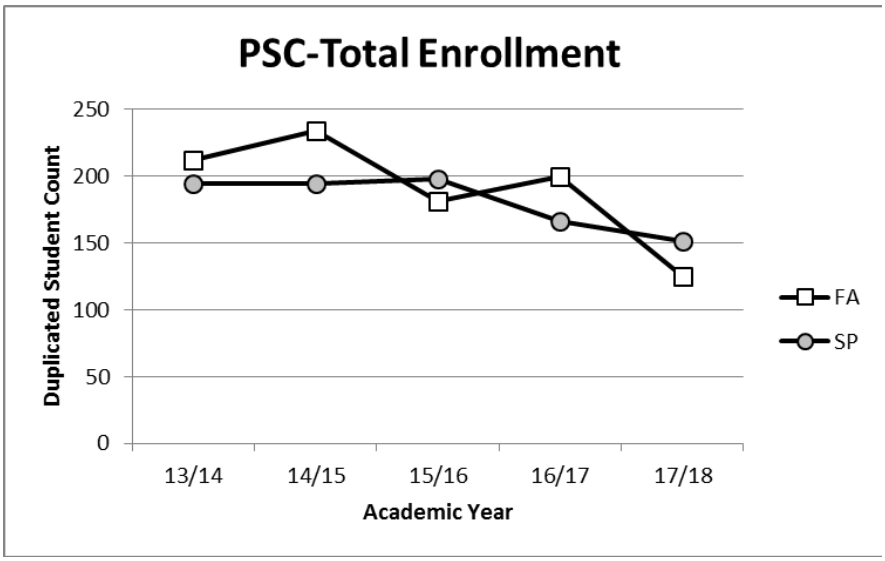


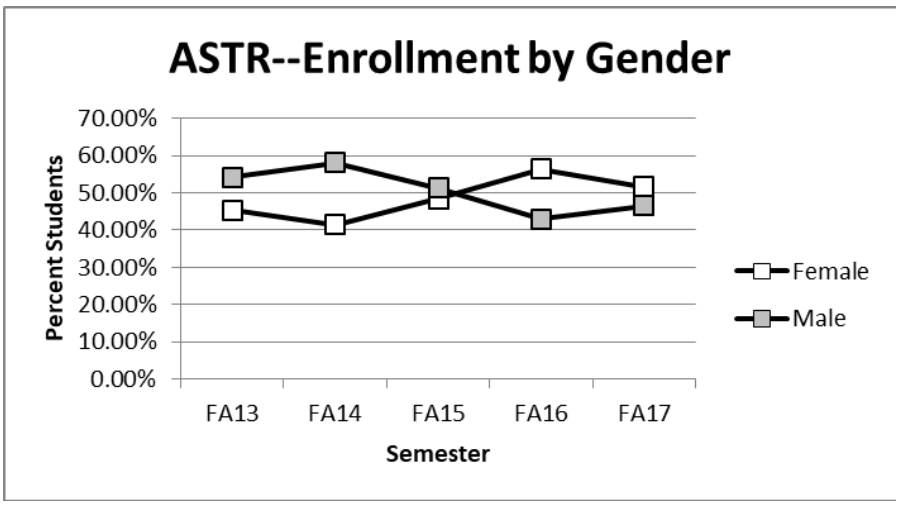
Patterns for Spring semesters are the same, so data are not shown.

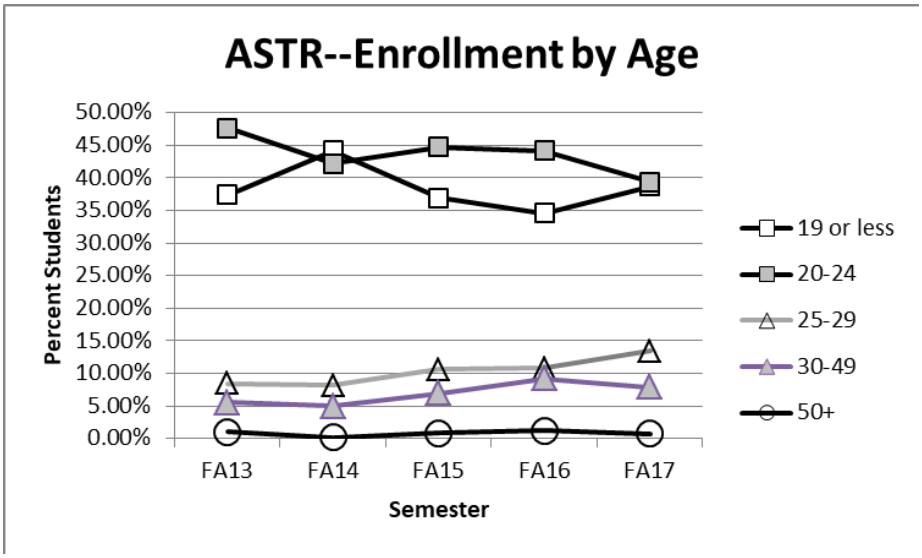
2. Enrollment Data

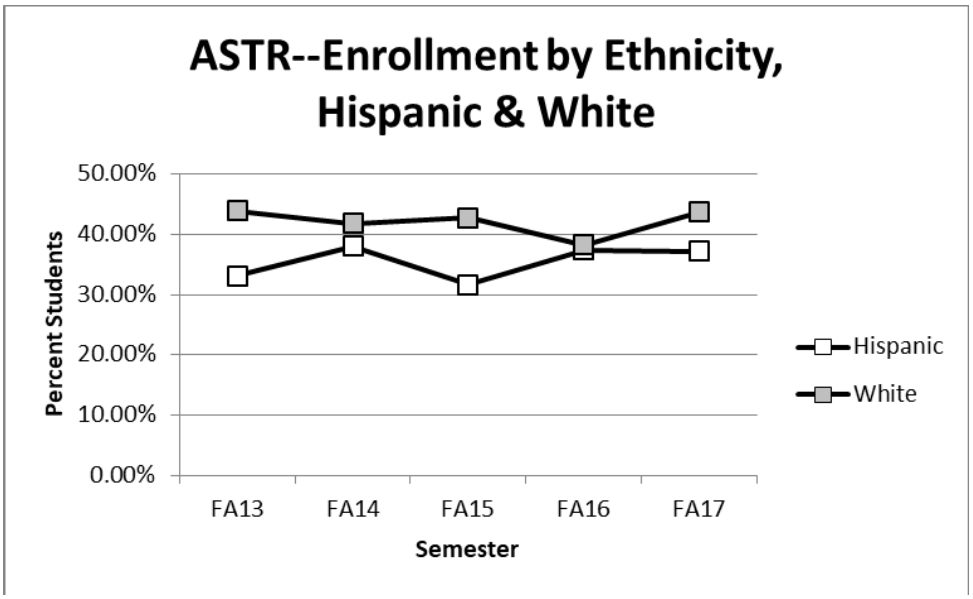


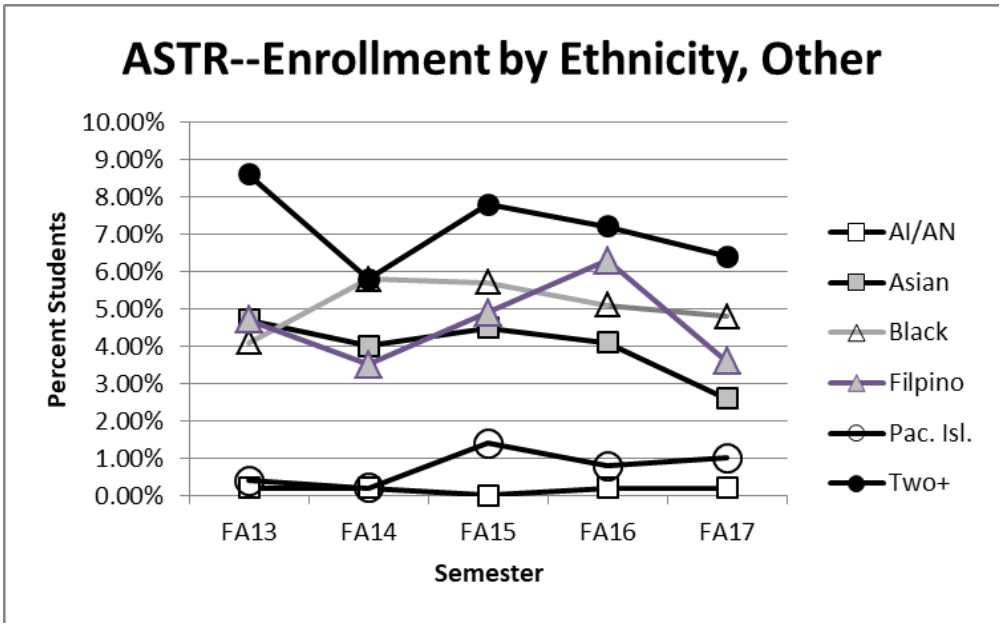

PHYC-Total Enrollment
Duplicated Student Count
500
450
400
350
300
250
200
150
100
50
0
13/14
14/15
15/16
16/17
17/18
Academic Year
FA
SP

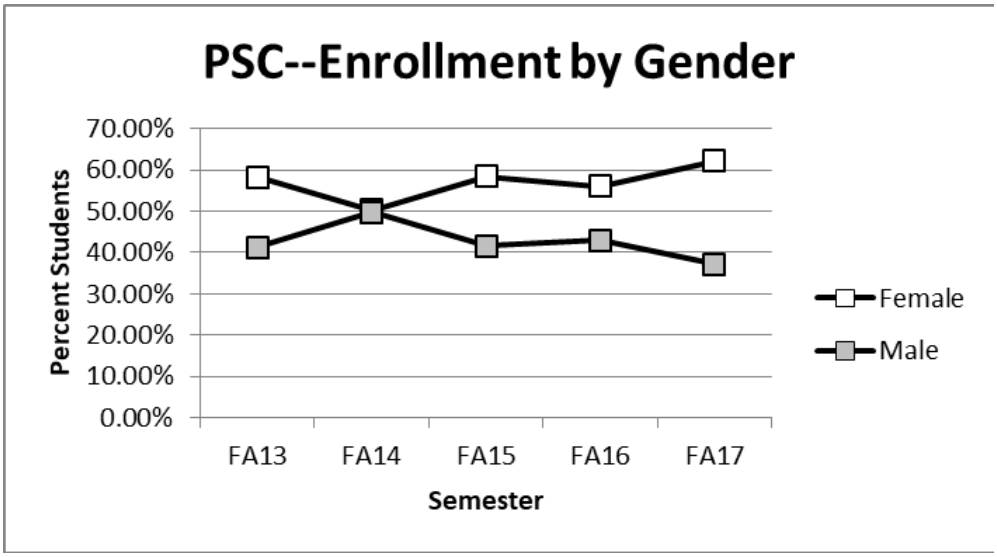

PSC-Total Enrollment
Duplicated Student Count
250
200
150
100
50
0
13/14
14/15
15/16
16/17
17/18
Academic Year
FA
SP

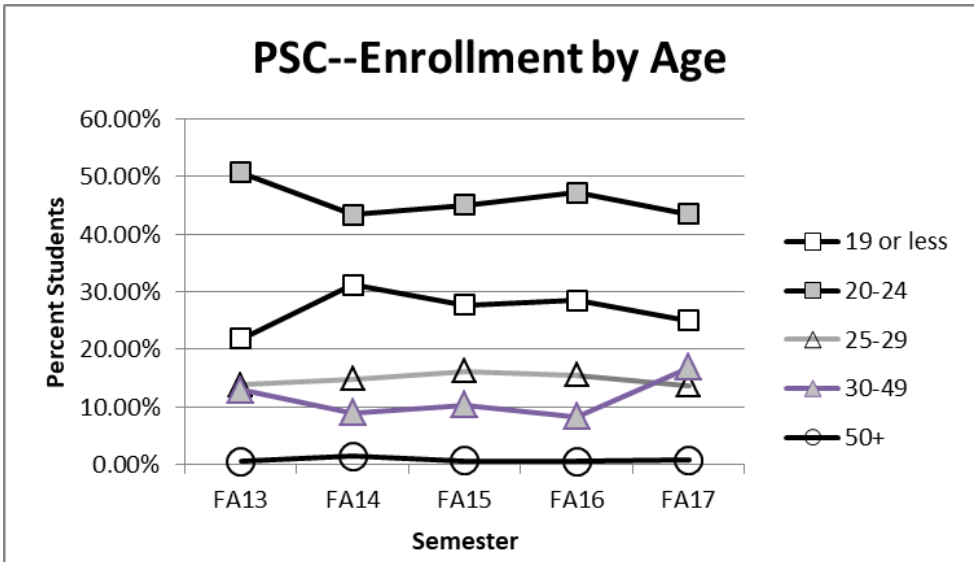

ASTR--Enrollment by Gender
Percent Students
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
FA13
FA14
FA15
FA16
FA17
Semester
Female
Male

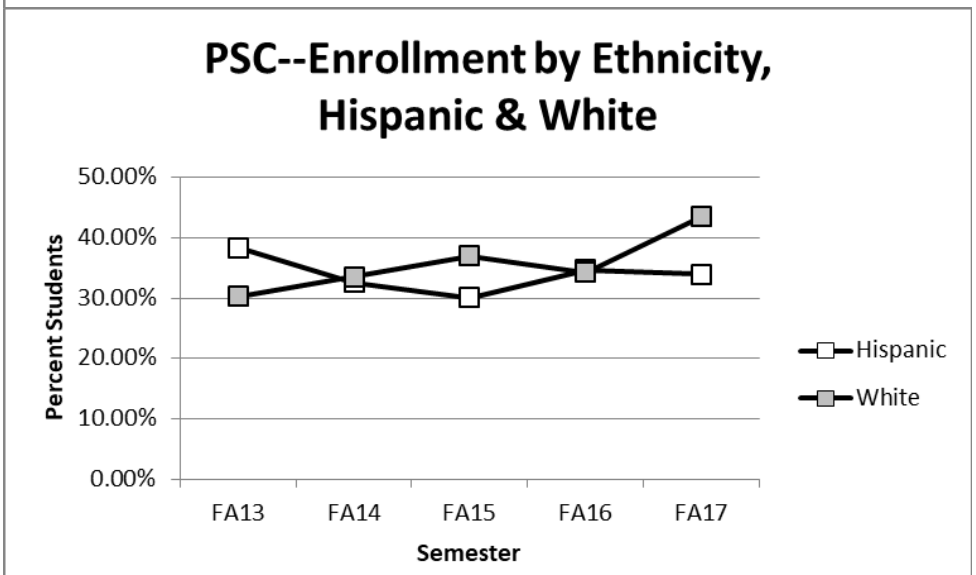

ASTR--Enrollment by Age
50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
19 or less
20-24
25-29
30-49
50+

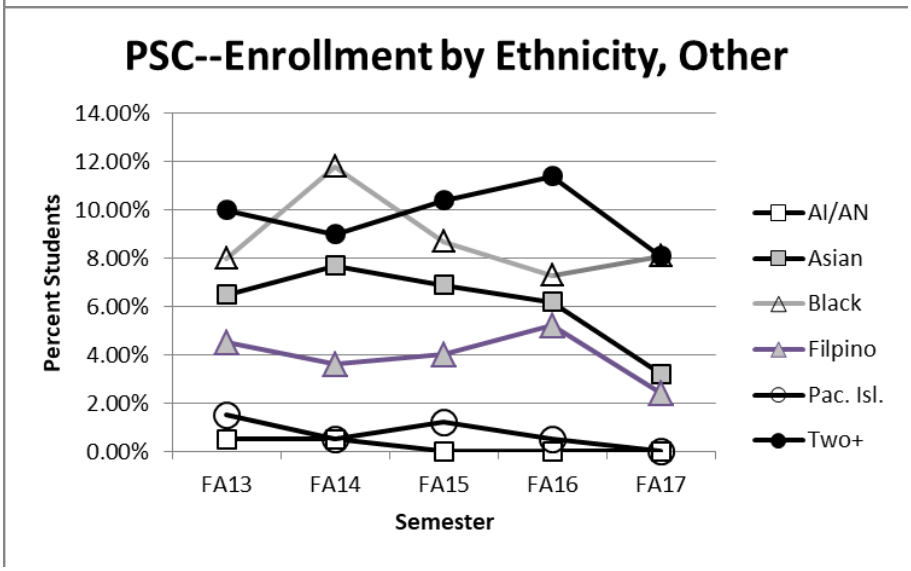

ASTR--Enrollment by Ethnicity, Hispanic & White
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
Hispanic
White

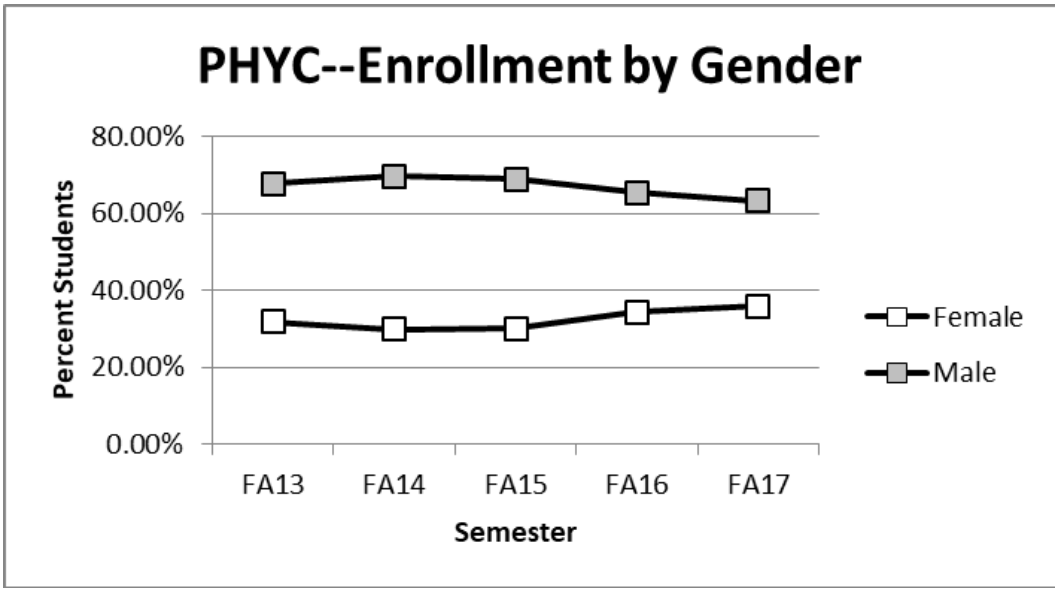

ASTR--Enrollment by Ethnicity, Other
10.00%
9.00%
8.00%
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
AI/AN
Asian
Black
Filpino
Pac. Isl.
Two+

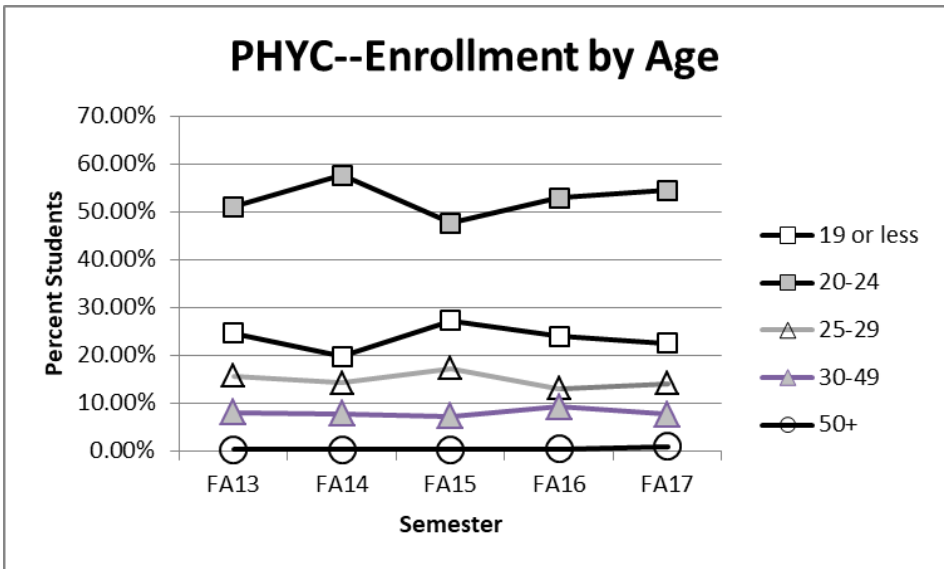

PSC--Enrollment by Gender
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
Female
Male

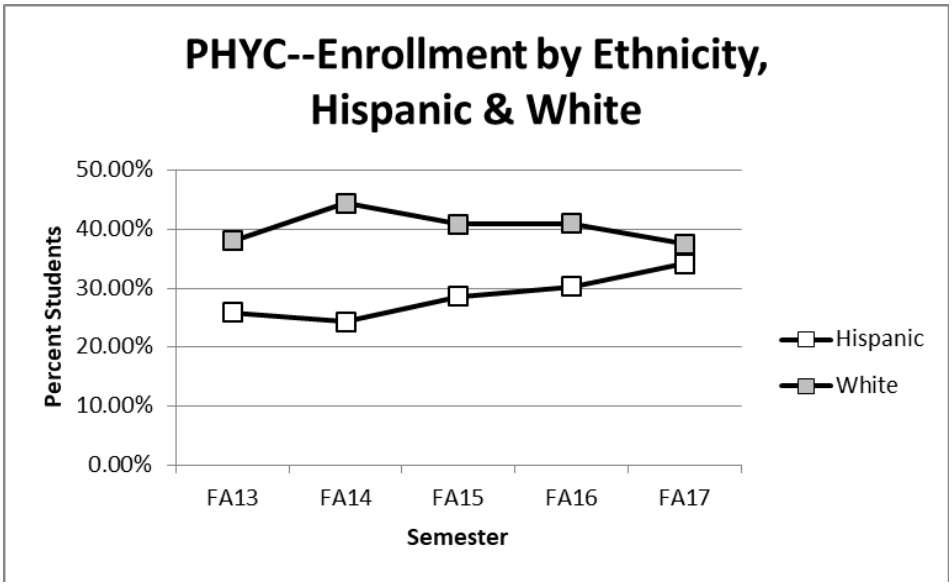

PSC--Enrollment by Age
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
19 or less
20-24
25-29
30-49
50+

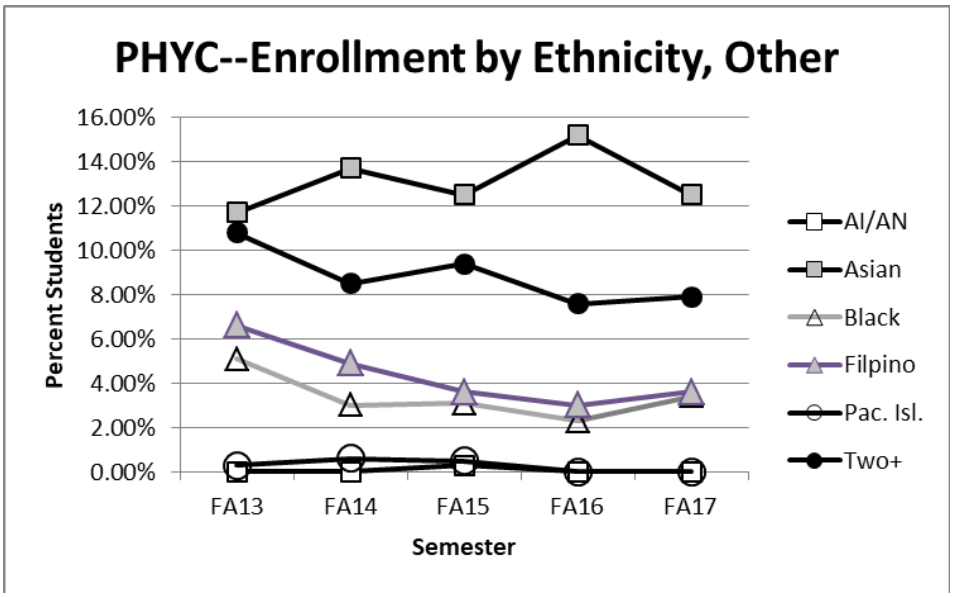

PSC--Enrollment by Ethnicity, Hispanic & White
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
Hispanic
White


PSC--Enrollment by Ethnicity, Other
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
AI/AN
Asian
Black
Filpino
Pac. Isl.
Two+


PHYC--Enrollment by Gender
80.00%
60.00%
40.00%
20.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
Female
Male

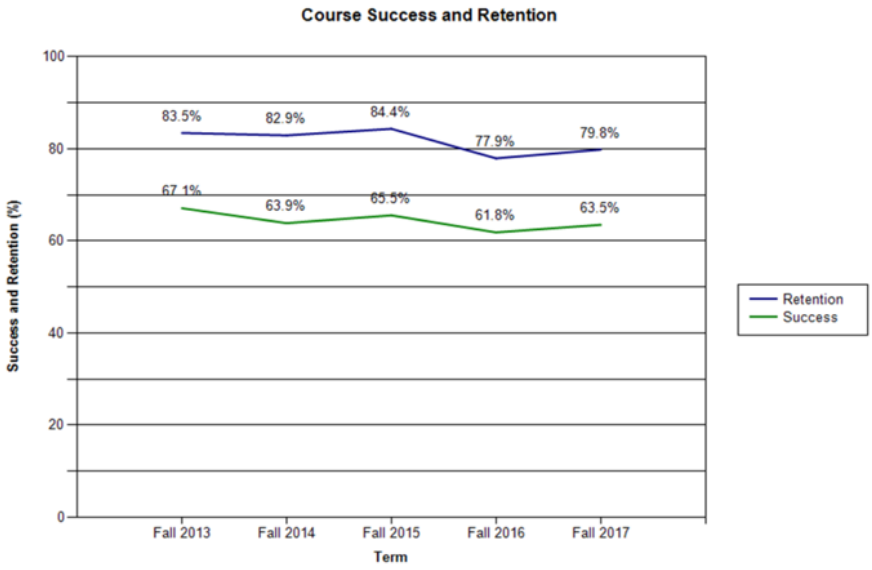

PHYC--Enrollment by Age
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
19 or less
20-24
25-29
30-49
50+


PHYC--Enrollment by Ethnicity, Hispanic & White
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
Hispanic
White

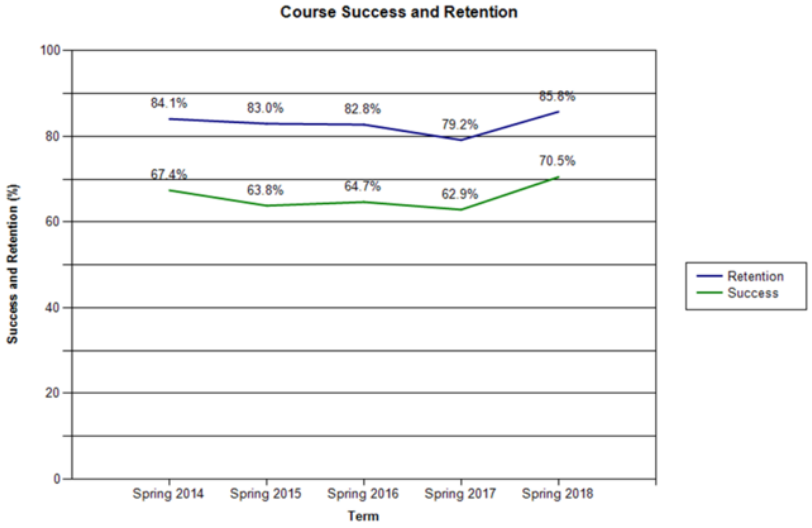

PHYC--Enrollment by Ethnicity, Other
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Percent Students
FA13
FA14
FA15
FA16
FA17
Semester
AI/AN
Asian
Black
Filpino
Pac. Isl.
Two+

3. Student Success Data

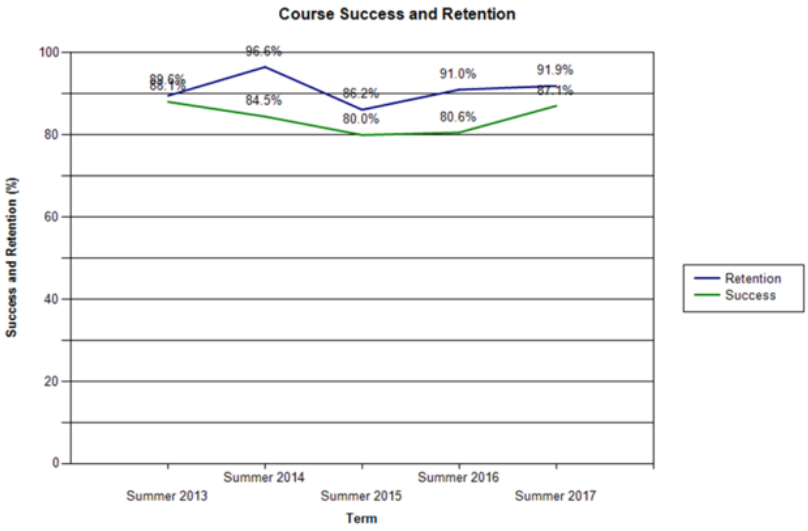
All Astronomy Students: Fall



All Astronomy Students: Spring



All Astronomy Students: Summer



4. Checklist Documentation (SLO, Instructional Operations, Articulation Officer, Library)

SLOs
Astronomy:

SLO Report - Four Column

SLO (MNSESW) - Astronomy

ASTR 105:Practice in Observational Astronomy

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - Determine the observability of an astronomical object based on its brightness and position in the sky, and the date, time, and location of the observer. **SLO Status:** Not offered on a regular basis. Will assess when offered next.	**Written Assignment/Essay -** Write a telescope proposal with a plan of observations. **Target/Benchmark (req)*:** Pass/Fail - the observation should be feasible within constraints. **Notes:** Trial entry made during Tracdat training. **Proposal prepared by:** P. Blanco	**Semester SLO Was Assessed:** 2020-2021 (Spring 2021) **Target/Benchmark Met:** Yes THIS IS A TEST! Zero faculty discussed the results of their telescope proposals, and all but 1 student passed. (They omitted the "-" in Declination.) (04/20/2018) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with NO changes made to the assessment or SLO [Please select the semester to be assessed from the list below] **Notes::** Talk about the importance of + and - signs more! **Unit/Program Improvement:** (If we were changing an outline or pre-req - curriculum committee.) **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Spring 2024) **Report prepared by:** P. Blanco this is a test!	
2 - Justify the selection of appropriate telescope and detector equipment in order to achieve a set of scientific goals. **SLO Status:** Not offered on a regular basis. Will assess when offered next.			

ASTR 110:Descriptive Astronomy

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - evaluate how the scientific method and astronomical observations are used to improve our understanding of the Universe and its contents. **SLO Status:** Active **Semester(s) to be Assessed:** 2015-2016 (Spring 2016)			
2 - be able to identify the important components and fundamental forces of the Universe. **SLO Status:** Active **Semester(s) to be Assessed:** 2016-2017 (Spring 2017)			
3 - explain the relationships between the components of the Universe. **SLO Status:** Active **Semester(s) to be Assessed:** 2017-2018 (Spring 2018)			
4 - explain how the Universe and its components change with time. **SLO Status:** Active **Semester(s) to be Assessed:** 2017-2018 (Spring 2018)			
5 - recognize how the physical laws are responsible for the behavior of the Universe. **SLO Status:** Active **Semester(s) to be Assessed:** 2020-2021 (Fall 2020)			

ASTR 112:General Astronomy Laboratory

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will employ laboratory equipment to obtain measurements **SLO Status:** Active **Semester(s) to be Assessed:** 2016-2017 (Fall 2016) **Notes:** Will assess when offered again	**Portfolio Review -** Instructor will provide grades for 3 laboratories that involve measurements with equipment, to be standardized across sections. **Target/Benchmark (req)*:** 67% of the students in all sections will pass the assessment measure. **Notes:** there are 3 sections this semester of this course - FA 2016 **Proposal prepared by:** Philip Blanco	**Semester SLO Was Assessed:** 2015-2016 (Spring 2016) **Target/Benchmark Met:** Yes A total of 50 students took the assessment. 81% passed. (08/19/2016) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Departmental Discussion Needed **Notes::** Revise the outcomes from 1989. **Unit/Program Improvement:** Discuss the outdated outline and see if we can improve the pass rate to 90% **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2022-2023 (Fall 2022) **Report prepared by:** jennifer carmean	
2 - Students will interpret data obtained in an experimental setting **SLO Status:** Active **Semester(s) to be Assessed:** 2017-2018 (Fall 2017) **Notes:** Will assess when offered	**Student Self-Assessment -** All 3 Astronomy 112 courses conducted the same lab (Density of Earth's Materials) and noted our results to the 5 questions based on the student data. **Target/Benchmark (req)*:** 67% **Proposal prepared by:** John (Brodney) Fitzgerald	**Semester SLO Was Assessed:** 2018-2019 (Fall 2018) **Target/Benchmark Met:** Yes 67% success on the 5 SLO questions. Questions are attached. (04/03/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with changes made to the assessment [Please select the semester to be assessed from the list below] **Notes::** Lowest percentage was question 3 and the highest percentage was question 4 even though the same formula is used for both questions. **Unit/Program Improvement:** No action required...department will reevaluate the assessment questions for the future. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Fall 2023) **Report prepared by:** Brodney Fitzgerald **Related Documents:** SLO number 2 questions for Astronomy 112.pdf	
3 - Students will communicate experimental results in a coherent manner **SLO Status:** Active **Semester(s) to be Assessed:** 2019-2020 (Spring 2020)			

ASTR 120:Exploration of the Solar System

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Identify the important components of the solar system. **SLO Status:** Active **Semester(s) to be Assessed:** 2015-2016 (Fall 2015)	**Exam/Quiz - In Course -** Multiple-choice questions relevant to the SLO, selected from the final exam. **Target/Benchmark (req)*:** At least 67% of students should score at least 67% in the assessment **Notes:** Updated Spring 2018 **Proposal prepared by:** Brodney Fitzgerald	**Semester SLO Was Assessed:** 2017-2018 (Spring 2018) **Target/Benchmark Met:** No 50% of students got the two assessment questions correct. The first question is: The Moon can be eclipsed and darkened by the shadow of the Earth during which phase? (Hint: draw a diagram). The second question is: Why is it that sometimes, when the Moon makes one complete trip around the Earth, there are no eclipses? (04/03/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Revise the SLO [Jot down ideas for future use/planning in the notes section below] **Notes::** Ask more questions about topics related to the SLO (3-5 questions) to test for partial success according to our 67% assessment metric. **Unit/Program Improvement:** Since class averages on 3 midterm exams were all 75% or above, the substandard performance on those 2 questions means we need to revise the questions but not the course. Also the 2 questions are among the most visually abstract questions that we ask for the course. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Spring 2024) **Report prepared by:** Brodney Fitzgerald	
		Semester SLO Was Assessed: 2015-2016 (Fall 2015) **Target/Benchmark Met:** Yes 24/35 or 68% of students scored higher than 67%. Average score was 80%. (12/16/2015) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with NO changes made to the assessment or SLO [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** The benchmark was met in this SLO. Continue asking these questions across other sections. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2021-2022 (Fall 2021) **Report prepared by:** Philip Blanco	**Action:** Scores were well above passing but only for 68% of students. Need to maintain or increase number of students above passing threshold. (10/03/2016)
2 - Recognize how the scientific	**Exam/Quiz - In Course -** Multiple-	**Semester SLO Was Assessed:** 2018-2019 (Fall 2018)	

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
method and astronomical observations are used to improve our understanding of the solar system. **SLO Status:** Active **Semester(s) to be Assessed:** 2015-2016 (Fall 2015)	choice questions relevant to the SLO, selected from the final exam. **Target/Benchmark (req)*:** At least 67% of students to score at least 67% in the assessment **Proposal prepared by:** Philip Blanco	**Target/Benchmark Met:** Yes 78% success on 2 SLO questions. Questions are attached. (04/03/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct a follow-up (less than 6 years out) assessment [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** No action required...we will reevaluate the questions for the next assessment. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Fall 2023) **Report prepared by:** Brodney Fitzgerald **Related Documents:** Fall SLOs for ASTR120 update.txt	
		Semester SLO Was Assessed: 2015-2016 (Fall 2015) **Target/Benchmark Met:** Yes 68% (24/35) of students scored 67% and higher. Class average was 70%. (12/16/2015) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with NO changes made to the assessment or SLO [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** Expand the assessment to other sections. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2021-2022 (Fall 2021) **Report prepared by:** Philip Blanco	
3 - Identify the fundamental forces and physical processes affecting the solar system. **SLO Status:** Active **Semester(s) to be Assessed:** 2015-2016 (Fall 2015)	**Exam/Quiz - In Course -** Multiple-choice questions relevant to the SLO, selected from the final exam. **Target/Benchmark (req)*:** At least 67% of students to score at least 67% in the assessment **Proposal prepared by:** Philip Blanco	**Semester SLO Was Assessed:** 2018-2019 (Fall 2018) **Target/Benchmark Met:** Yes 78% success for all 5 SLO questions. Questions are attached. (04/03/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct a follow-up (less than 6 years out) assessment [Please select the semester to be assessed from the list below] **Notes::** Fourth question where 6 students out of 36 were correct was an outlier. **Unit/Program Improvement:** No action needed...will reevaluate for the next assessment. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Fall 2023) **Report prepared by:** Brodney Fitzgerald **Related Documents:**	

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
		Fall SLOs for ASTR120 update.txt **Semester SLO Was Assessed:** 2015-2016 (Fall 2015) **Target/Benchmark Met:** No 57% of students scored above 67%. Average score was 4.5/7 or 64.3% (12/16/2015) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with NO changes made to the assessment or SLO [Please select the semester to be assessed from the list below] **Notes::** 1 question was responsible for the missed benchmark with only 10/35 getting it correct: The gravitational force of the Sun ON Mercury is directed.... A. along Mercury's orbital path B. Inwards at right angles to Mercury's orbital velocity C. from the Sun towards Mercury D. from Mercury towards the Sun. **Unit/Program Improvement:** Reword the question that most students got wrong - the wording used in the assessment may have been confusing, because most students correctly depicted the answer on a diagram question. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2021-2022 (Fall 2021) **Report prepared by:** Philip Blanco	
4 - Explain the relationships between the components of the Solar System. **SLO Status:** Active **Semester(s) to be Assessed:** 2016-2017 (Fall 2016)	**Exam/Quiz - In Course -** Embedded questions in final exam **Target/Benchmark (req)*:** 67% of students score at least 67% **Proposal prepared by:** Philip Blanco	**Semester SLO Was Assessed:** 2017-2018 (Spring 2018) **Target/Benchmark Met:** Yes 87% success in answer 2 questions related to the SLO. Question 1: As gravity pulls gas and dust together in a region of space, what happens? Question 2: How do scientists believe Earth acquired its Moon? (04/03/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with changes made to the assessment [Please select the semester to be assessed from the list below] **Notes::** Changes may be made to the SLO questions in the future. **Unit/Program Improvement:** We can increase the number of assessment questions from 2 to 3-5 questions to allow us to measure partial assessment of the SLO.	

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
		Next Semester SLO/ASO/SSO/ISO Will Be Assessed: 2023-2024 (Spring 2024) **Report prepared by:** Brodney Fitzgerald	
		Semester SLO Was Assessed: 2015-2016 (Spring 2016) **Target/Benchmark Met:** Yes Students did very well! (10/03/2016) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with NO changes made to the assessment or SLO [Please select the semester to be assessed from the list below] **Notes::** Don't change anything, or you will ruin this great result! **Unit/Program Improvement:** Can't improve on perfection! **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2021-2022 (Spring 2022) **Report prepared by:** Philip Blanco	
5 - Explain how the Solar System and its components change with time. **SLO Status:** Active **Semester(s) to be Assessed:** 2016-2017 (Fall 2016)	**Exam/Quiz - In Course -** Multiple-choice questions relevant to the SLO, selected from the final exam. **Target/Benchmark (req)*:** At least 67% of students to score at least 67% in the assessment **Proposal prepared by:** Philip Blanco	**Semester SLO Was Assessed:** 2018-2019 (Fall 2018) **Target/Benchmark Met:** Yes 83% for all 6 SLO questions. The questions are attached. (04/03/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct a follow-up (less than 6 years out) assessment [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** No action needed...will reevaluate for future assessment **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Fall 2023) **Report prepared by:** Brodney Fitzgerald **Related Documents:** Fall SLOs for ASTR120 update.txt	

ASTR 199:Special Studies or Projects in Astronomy

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to identify, examine, and assess a component of the discipline in a study of individualized content. **SLO Status:** Inactive **Notes:** Will assess when offered again			

ASTR 298:Selected Topics in Astronomy

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to describe, distinguish and apply components of the discipline within a specialized topic of the discipline. **SLO Status:** Inactive **Notes:** Will assess when offered again			

SLO Report - Four Column

SLO (MNSESW) - Physical Science

PSC 100:Physical Science for Elementary Education

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - Students will have a working knowledge of the language of chemistry and physics **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			
2 - Students will apply qualitative reasoning to chemistry and physics problems **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			
3 - Students will apply quantitative reasoning to chemistry and physics problems **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			

ASTR 299 AB:Selected Topics in Astronomy

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - A: Students will be able to define and analyze components of the discipline within a specialized topic of the discipline. B: Students will be able to define, analyze, and synthesize components of the discipline within a specialized topic of the discipline. **SLO Status:** Inactive **Notes:** Will assess when offered again			

Physical Sciences:

SLO Report - Four Column

SLO (MNSESW) - Physical Science

PSC 100:Physical Science for Elementary Education

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - Students will have a working knowledge of the language of chemistry and physics **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			
2 - Students will apply qualitative reasoning to chemistry and physics problems **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			
3 - Students will apply quantitative reasoning to chemistry and physics problems **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			

PSC 110:Introduction to the Physical Sciences

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - Students will have a working knowledge of the language of physical sciences **SLO Status:** Active			
2 - Students will apply qualitative reasoning to physical science problems **SLO Status:** Active			
3 - Students will apply quantitative reasoning to physical science problems **SLO Status:** Active			

PSC 111:Physical Science Laboratory

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will employ laboratory equipment to obtain measurements **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)	**Portfolio Review -** Instructor will grade a laboratory assignment where students enter data in their laboratory notebook and answer standardized questions based on their data. **Target/Benchmark (req)*:** 67% of the students in all sections will pass the assessment measure. **Notes:** there was 1 section of this course in Spring 2019 **Proposal prepared by:** Brodney Fitzgerald	**Semester SLO Was Assessed:** 2018-2019 (Spring 2019) **Target/Benchmark Met:** Yes The average score for the 9 students was 19.2 out of 20 (the range of scores was 19-20). All 9 students (100%) scored above 67% on this SLO. (08/23/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with changes made to the assessment [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** No action needed...department will reevaluate the assessment questions for the future. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Spring 2024) **Report prepared by:** Brodney Fitzgerald	
2 - Students will interpret data obtained in an experimental setting **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)	**Portfolio Review -** Instructor will grade a laboratory assignment where students enter data in their laboratory notebook and answer standardized questions based on their data. **Target/Benchmark (req)*:** 67% of the students in all sections will pass the assessment measure. **Notes:** there was 1 section of this course in Spring 2019 **Proposal prepared by:** Brodney Fitzgerald	**Semester SLO Was Assessed:** 2018-2019 (Spring 2019) **Target/Benchmark Met:** Yes The average score for the 9 students was 16.7 out of 20 (the range 16-20). All 9 students (100%) scored above 67% on this SLO. (08/23/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with changes made to the assessment [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** No action required...department will reevaluate the assessment questions for the future. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Spring 2024) **Report prepared by:** Brodney Fitzgerald	
3 - Students will communicate experimental results in a coherent manner **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)	**Portfolio Review -** Instructor will grade a laboratory assignment where students enter data in the laboratory notebook and answer standardized questions based on their data. **Target/Benchmark (req)*:** 67% of	**Semester SLO Was Assessed:** 2018-2019 (Spring 2019) **Target/Benchmark Met:** Yes The average score for 9 students was 18.6 out of 20 (the range was 16-20 points). All 9 students (100%) scored above 67% on this SLO. (08/23/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with changes made to the	

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
	the students in all sections will pass the assessment measure. **Notes:** there was 1 section of the course in Spring 2019 **Proposal prepared by:** Brodney Fitzgerald	assessment [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** No action needed...department will reevaluate the assessment questions for the future. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Spring 2024) **Report prepared by:** Brodney Fitzgerald	

PSC 120:Fundamentals of Scientific Computing

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - Analyze problems in applied mathematics and science including statistics, engineering, physical and life sciences. **SLO Status:** Active **Semester(s) to be Assessed:** 2019-2020 (Fall 2019) **SLO Last Updated:** 12/08/2015 **Notes:** This is a new course added FA 2015.			
2 - Develop design solutions in the MATLAB computing environment. **SLO Status:** Active **Semester(s) to be Assessed:** 2019-2020 (Fall 2019) **SLO Last Updated:** 12/08/2015 **Notes:** A new course added Fall 2015.			
3 - Implement solutions using the fundamental concepts of scientific computing. **SLO Status:** Active **Semester(s) to be Assessed:** 2019-2020 (Fall 2019) **SLO Last Updated:** 12/08/2015 **Notes:** This is a new course added FA 2015.			

PSC 199:Special Studies or Projects in Physical Science

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to identify, examine, and assess a component of the discipline in a study of individualized content. **SLO Status:** Active			

PSC 298:Selected Topics in Physical Science

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to describe, distinguish and apply components of the discipline within a specialized topic of the discipline. **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			

PSC 299 AB:Selected Topics in Physical Science

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - A: Students will be able to define and analyze components of the discipline within a specialized topic of the discipline. **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			
2 - B: Students will be able to define, analyze, and synthesize components of the discipline within a specialized topic of the discipline. **SLO Status:** Active **Semester(s) to be Assessed:** 2014-2015 (Spring 2015)			

Physics:

SLO Report - Four Column

SLO (MNSESW) - Physics

PHYC 110:Introductory Physics

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - Students will have a working knowledge of the language of physics **SLO Status:** Active			
2 - Students will apply qualitative reasoning to physics problems **SLO Status:** Active			
3 - Students will apply quantitative reasoning to physics problems **SLO Status:** Active			
4 - Students will employ laboratory equipment and techniques to collect, organize and evaluate experimental data. **SLO Status:** Active			

PHYC 130:Fundamentals of Physics

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to apply thermodynamic principles to systems involving solids and ideal gasses. **SLO Status:** Active	**Exam/Quiz - In Course -** Solve a written Physics problem and the rubric from 0 to 5 as part as the cumulative final exam. **Target/Benchmark (req)*:** 67% will get 67% or higher on the selected Physics problem. **Proposal prepared by:** Brodney Fitzgerald	**Semester SLO Was Assessed:** 2018-2019 (Fall 2018) **Target/Benchmark Met:** No 22 out of 58 students scored 3.5 or above across 3 sections of the course. (04/03/2019) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Develop new methods of evaluating student work [Jot down ideas for future use/planning in the notes section below] **Notes::** Include a combination of multiple choice and written questions in the assessment. We will possibly assess during the semester (but not the final). **Unit/Program Improvement:** We will have department discussions about the importance of relevant content and any changes needed. However, this course is aligned with the same course at Cuyamaca which will made it difficult to make any changes to the content. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2023-2024 (Fall 2023) **Report prepared by:** Brodney Fitzgerald **Related Documents:** Fall2018-PHYC130-SLO3question.pdf	
2 - Students will be able to apply Newton's Laws to static and dynamic systems of particles and rigid bodies	**Exam/Quiz - In Course -** Identify final exam multiple-choice questions that test students' ability to apply Newton's Laws **Target/Benchmark (req)*:** At least 67% of students should score 67% or higher. **Proposal prepared by:** Philip Blanco	**Semester SLO Was Assessed:** 2015-2016 (Fall 2015) **Target/Benchmark Met:** No 8 multiple-choice questions were selected for this SLO from the final exam. The class average was 62.5%, with 11/22 (50%) of students scoring above 67%. (12/16/2015) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Departmental Discussion Needed **Notes::** Two questions out of the 8 assessed brought down students' scores below the target/benchmark, with only 6 and 7 out of 22 students responding correctly: (1) You riding an elevator which is moving upwards and slowing down. The normal force as giving by a scale reading is _____ your weight. (A) greater than (B) less than (C) equal to (D) can be more or less than (2) A box rests on an inclined plane. As the angle of the plane is increased, and until it starts to slide downhill, the normal force _____ while the force of static friction _____.	

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
		A. decreases, decreases B. decreases, increases C. decreases, remains constant D. increases, increases. **Unit/Program Improvement:** Field these questions in other sections to see if there is a problem with the way that the two applications above are taught. **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2021-2022 (Fall 2021) **Report prepared by:** Philip Blanco	
3 - Students will distinguish between conservation principles and apply them appropriately to physical systems. **SLO Status:** Active			
4 - Students will employ laboratory equipment and techniques to acquire experimental measurements, interpret the data, and communicate the results in a coherent manner. **SLO Status:** Active	**Written Assignment/Essay -** Use the laboratory report score portion of the overall grade, without an extra credit **Target/Benchmark (req)*:** At least 67% of students score at least 67% in the lab report portion of their grade. **Proposal prepared by:** Philip Blanco	**Semester SLO Was Assessed:** 2015-2016 (Fall 2015) **Target/Benchmark Met:** Yes 1/28 students received below 67% (46%) mainly due to missing work. The next highest lab grade was 73%. (12/16/2015) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with changes made to the assessment [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** N?A **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2021-2022 (Fall 2021) **Report prepared by:** Philip Blanco	

PHYC 131:Fundamentals of Physics

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to calculate electric fields, magnetic fields and electrical potentials. **SLO Status:** Active			
2 - Students will be able to apply the laws of motion and conservation principles to charged particles. **SLO Status:** Active			
3 - Students will be able to analyze electrical circuits containing a variety of components. **SLO Status:** Active			
4 - Students will be able to calculate the behavior of light and matter using quantum mechanical principles **SLO Status:** Active			
5 - Students will be able to analyze the propagation of light through optical systems **SLO Status:** Active			
6 - Students will be able to apply the principles of special relativity to the motion of objects. **SLO Status:** Active			
7 - Students will employ laboratory equipment and techniques to acquire experimental measurements, interpret the data, and communicate the results in a coherent manner. **SLO Status:** Active			

PHYC 140:Mechanics of Solids

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to apply Newton's Laws to static and dynamic systems of particles. **SLO Status:** Active			
2 - Students will apply Newton's laws to static and dynamic systems of rigid bodies. **SLO Status:** Active			
3 - Students will distinguish between conservation principles and apply them appropriately to physical systems. **SLO Status:** Active			
4 - Students will employ laboratory equipment and techniques to acquire experimental measurements, interpret the data, and communicate the results in a coherent manner. **SLO Status:** Active			

PHYC 199:Special Studies or Projects in Physics

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to identify, examine, and assess a component of the discipline in a study of individualized content. **SLO Status:** Active			

PHYC 240:Electricity, Magnetism and Heat

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to apply fhe first and second laws of thermodynamics to systems involving solids and ideal gasses. **SLO Status:** Active **Semester(s) to be Assessed:** 2013-2014 (Fall 2013)			
2 - Students will be able to calculate electric fields and potentials. **SLO Status:** Active **Semester(s) to be Assessed:** 2013-2014 (Fall 2013)			
3 - Students will be able to recognize when magnetic fields are present and calculate their properties. **SLO Status:** Active **Semester(s) to be Assessed:** 2013-2014 (Fall 2013)			
4 - Students will be able to apply the laws of motion and conservation principles to charged particles. **SLO Status:** Active **Semester(s) to be Assessed:** 2013-2014 (Fall 2013)			
5 - Students will be able to analyze electrical circuits containing a variety of components. **SLO Status:** Active **Semester(s) to be Assessed:** 2013-2014 (Fall 2013)			
6 - Students will employ laboratory equipment and techniques to acquire experimental measurements, interpret the data, and communicate the results in a coherent manner.			

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
SLO Status: Active **Semester(s) to be Assessed:** 2013-2014 (Fall 2013)			

PHYC 241:Light, Optics and Modern Physics

SLOs	*Assessment Methods*	*Course SLO Assessment Results/Analyses*	*Actions*
1 - Students will be able to apply the laws of physics to the propagation of mechanical and E&M waves. **SLO Status:** Active			
2 - Students will be able to analyze the propagation of light through optical systems. **SLO Status:** Active			
3 - Students will be able to calculate the behavior of light and matter using quantum mechanical principles. **SLO Status:** Active			
4 - Students will be able to apply the principles of special relativity to the motion of objects. **SLO Status:** Active			
5 - Students will employ laboratory equipment and techniques to acquire experimental measurements, interpret the data, and communicate the results in a coherent manner. **SLO Status:** Active	**Written Assignment/Essay -** Use the overall score for laboratory reports throughout the semester. **Target/Benchmark (req)*:** At least 67% of students score at least 67% in the lab report portion of their grade. **Proposal prepared by:** Philip Blanco	**Semester SLO Was Assessed:** 2015-2016 (Fall 2015) **Target/Benchmark Met:** Yes 1/17 students received 57% for their lab report grade, mainly due to missing work. All others received well above 67%. (12/16/2015) **Course SLO Action (CLICK "?" FOR SPECIFICS):** Conduct regularly-scheduled assessment with changes made to the assessment [Please select the semester to be assessed from the list below] **Unit/Program Improvement:** N/A **Next Semester SLO/ASO/SSO/ISO Will Be Assessed:** 2021-2022 (Fall 2021) **Report prepared by:** Philip Blanco	

PHYC 298:Selected Topics in Physics

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - Students will be able to describe, distinguish and apply components of the discipline within a specialized topic of the discipline. **SLO Status:** Active			

PHYC 299 AB:Selected Topics in Physics

SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions
1 - A: students will be able to define and analyze components of the discipline within a specialized topic of the discipline. **SLO Status:** Active			
2 - B: Students will be able to define, analyze, and synthesize components of the discipline within a specialized topic of the discipline. **SLO Status:** Active			

SLO (MNSESW) - Astronomy › Home

Course Summary - Owned

		Courses		SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions	Follow-Up
	✗	ASTR 105 - Practice in Observational Astronomy		0	0	0	0	0
▾	✗	ASTR 110 - Descriptive Astronomy		5	0	0	0	0
			✗	1	0	0	0	0
			✗	2	0	0	0	0
			✗	3	0	0	0	0
			✗	4	0	0	0	0
			✗	5	0	0	0	0
▾	✗	ASTR 112 - General Astronomy Laboratory		3	2	2	0	0
			✓	1	1	1	0	0
			✓	2	1	1	0	0
			✗	3	0	0	0	0
▾	✓	ASTR 120 - Exploration of the Solar System		5	5	9	1	0
			✓	1	1	2	1	0
			✓	2	1	2	0	0
			✓	3	1	2	0	0
			✓	4	1	2	0	0
			✓	5	1	1	0	0

SLO (MNSESW) - Physics

0 Welcome, felicia.kalker

SLO (MNSESW) - Physics › Home

		Courses		SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions	Follow-Up
▾	✗	PHYC 110 - Introductory Physics		4	0	0	0	0
			✗	1	0	0	0	0
			✗	2	0	0	0	0
			✗	3	0	0	0	0
			✗	4	0	0	0	0
▾	✗	PHYC 130 - Fundamentals of Physics		3	2	2	0	0
			✓	1	1	1	0	0
			✗	3	0	0	0	0
			✓	4	1	1	0	0
▾	✗	PHYC 131 - Fundamentals of Physics		7	0	0	0	0
			✗	1	0	0	0	0
			✗	2	0	0	0	0
			✗	3	0	0	0	0
			✗	4	0	0	0	0
			✗	5	0	0	0	0
			✗	6	0	0	0	0
			✗	7	0	0	0	0
▾	✗	PHYC 140 - Mechanics of Solids		4	0	0	0	0
			✗	1	0	0	0	0
			✗	2	0	0	0	0
			✗	3	0	0	0	0
			✗	4	0	0	0	0

✖	PHYC 240 - Electricity, Magnetism and Heat		6	0	0	0	0
		✖ 1		0	0	0	0
		✖ 2		0	0	0	0
		✖ 3		0	0	0	0
		✖ 4		0	0	0	0
		✖ 5		0	0	0	0
		✖ 6		0	0	0	0
✖	PHYC 241 - Light, Optics and Modern Physics		5	1	1	0	0
		✖ 1		0	0	0	0
		✖ 2		0	0	0	0
		✖ 3		0	0	0	0
		✖ 4		0	0	0	0
		✔ 5		1	1	0	0

SLO (MNSESW) - Physical Science

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SLO (MNSESW) - Physical Science › Home

Course Summary - Owned

		Courses		SLOs	Assessment Methods	Course SLO Assessment Results/Analyses	Actions	Follow-Up
✖	PSC 100 - Physical Science for Elementary Education		3	0	0	0	0	
		✖ 1		0	0	0	0	
		✖ 2		0	0	0	0	
		✖ 3		0	0	0	0	
✖	PSC 110 - Introduction to the Physical Sciences		3	0	0	0	0	
		✖ 1		0	0	0	0	
		✖ 2		0	0	0	0	
		✖ 3		0	0	0	0	
✔	PSC 111 - Physical Science Laboratory		3	3	3	0	0	
		✔ 1		1	1	0	0	
		✔ 2		1	1	0	0	
		✔ 3		1	1	0	0	
✖	PSC 120 - Fundamentals of Scientific Computing		3	0	0	0	0	
		✖ 1		0	0	0	0	
		✖ 2		0	0	0	0	
		✖ 3		0	0	0	0	

Library Resources for Physical Sciences

Books
The library Physical Sciences area, comprised of call numbers Q, for Physical Sciences, QB, for Astronomy, and QC, for Physics, breaks down as follows:

	Print Books	Electronic books	Print Reference	Totals
Q	179	2320	23	2522
QB	220	1015	0	1235
QC	292	2709	0	3001

This makes for a total number of books of 6758 in Physical Sciences as a whole.

There are also two online reference book (such as dictionaries, encyclopedias, handbooks, and manuals) collections that contain thousands of entries related to the field of Physical Sciences. These collections, or databases, are called "Gale Virtual Reference Library" and "Credo."

Books are purchased using a complex allocation formula to ensure that departments get their fair share of the year's (in this case, 2018/19) $80,000 annual library book budget. The breakdown of allocation vs. spent is as follows:

	Allocated	Spent
Q	$345	0
QB	$722	$1019
QC	$821	$813

For the entire area, $1,888 was allocated, and $1,832 spent.

All electronic materials, whether books or journal articles, can be accessed anytime, anywhere.

Periodicals
Most of the Physical Sciences periodicals are in electronic format, within library periodical databases. This allows for keyword searching, and anytime, anywhere access.

The library subscribes to a number of multidisciplinary periodical article databases, all of which contain tens of thousands of articles related to Physical Sciences – databases that include Academic OneFile, Academic Search Complete, and Gale General OneFile.

Media
The library makes available four streaming video databases that cover all subject areas; for example, the electronic databases 1) Films on Demand, 2) Intelecom, 3) Kanopy, and 4) the San Diego County streaming service called Swank. The video material in these databases is readily available electronically 24/7, without ever having to come to the library. Therefore they work well as a complement to classroom presentations.

Date: October 9th, 2019

To: Brodney Fitzgerald and Sebastian Cormier, Department Faculty

From: M. Denise Aceves, Articulation Officer

Re: Physics Department, including Astronomy & Physical Science • Program Review Checklist

The process of articulation is two-fold. First, transferability must be established. A transferable course is one that is taken at a community college and can be used for unit credit at a university. The next step, is the articulation of courses deemed transferrable. Articulation is the formal, written agreement that identifies courses on a "sending" campus that are comparable or acceptable in lieu of specific course requirements at a "receiving" campus. Thus, articulation identifies courses that a student should take at community college to meet university degree requirements.

In response to your request for articulation information, Astronomy, Physics and Physical Sciences courses at Grossmont College are well-articulated. All formal articulation with our 4-year public education partners can be found at *ASSIST.org*, which is the public articulation repository available to current and potential college students. Please note that ASSIST.org currently only reflects articulation information through 2016-2017 and partially updated information.

All of the theory courses in these disciplines are transferrable to both CSU and UC Systems, with the exception of Astronomy 105 which is only transferrable to the CSU. Furthermore, courses in this discipline have been evaluated by the CSU and UC systems to meet requirements for general education. As a result, approved Astronomy, Physics and Physical Sciences courses assist students in meeting CSU General Education Breadth requirements in the area of Scientific Inquiry and Quantitative Reasoning. Similarly, there are approved Astronomy, Physics and Physical Science courses in the Physical and Biological Sciences area of IGETC. All courses that have received transferability and general education designations are notated as such at the end of each course description in the Grossmont College Catalog. The courses with course to course articulation by department with specific CSUs and UCs can be found on *ASSIST.org*.

Locally, our public 4-year educational partners include: San Diego State University (SDSU), California State University San Marcos (CSUSM) and the University of California, San Diego (UCSD). Articulation with the corresponding departments are robust and Grossmont College's Astronomy, Physics and Physical Science courses have attained course to course articulations. Once ASSIST is fully operational, the department is encouraged to review their course to course articulations on *ASSIST.org* and work with me, the Articulation Officer, to correct any inconsistencies as well as to develop new articulations.

The Physics Department has also successfully offered the Physics Associate of Science for Transfer (AS-T) in compliance with Senate Bill 1440. To this end, the Physics Department has worked collaboratively with the Curriculum Committee, Instructional Operations and the Articulation Officer to establish the Physics AS-T. Similarly, the department has been responsive to Course Identification (C-ID) required for courses in the degree.

Most recently, the Physics department has worked collegially with the Cuyamaca Physics department to align Physics curriculum. The alignment of the calculus based Physics sequence (140, 240, and 241) is a tremendous

amount of work, but will make it significantly easier for GCCCD students to earn equivalent course credit while attending at either college. The department has also worked with the Articulation Officer and Instructional Operations closely to ensure continued transfer articulation and complete local curriculum processes.

Articulation is facilitated with current, concise and thorough course outlines. It is imperative that the outlines and text books listed be current. The requirement that course outlines be updated every 5 years through the Grossmont College Curriculum process is vital. Students benefit from the many colleges and universities who have articulated our courses in Physics. Below I have listed the link to *The Course Outline of Record: A Curriculum Reference Guide Revisited*, a document adopted by the Academic Senate for California Community Colleges in Spring 2017, as well as the latest standards for CSU GE Breadth and IGETC.

Curriculum Resources

- The Course Outline of Record: A Curriculum Reference Guide Revisited
- Guiding Notes for General Education Course Reviewers
- Standards, Policies & Procedures for Intersegmental General Education Transfer Curriculum, Version 1.9

You are welcome to contact me directly at mariadenise.aceves@gcccd.edu with any questions regarding this report.

INSTRUCTIONAL OPERATIONS Email?

5. Answer to committee follow up questions. This step is completed *after* the committee reads your report. Add your answers to the digital copy of your report, and email a digital copy to the Program Review Chair.

Answers to Program Review Follow Questions for Physics, Astronomy, & Physical Sciences

1.2 Previous PR Goal 4- tell us more about the Equity course faculty attended. When will these faculty be able to share this information with the rest of the dept.?

The team (made up of members from throughout the campus) that went to the equity conference is preparing to share the information with the campus at large. The department attendee (Cormier) was not involved with all of the planning for last semester but will be involved again this semester.

2.2 Tell us more about the engagement strategies used in the classroom and in which courses?

As we described in Section 2.3, we use the Think-Pair-Share technique with ABCD cards in our Astronomy 110 and 120 courses. We also use clickers and the ABCD cards in our Physics courses and Physical Sciences courses. Lastly we use the muddiest point exercise in our Physics, Astronomy, and Physical Sciences courses to gain feedback from our students (e.g. which topic was did you understand the most/least? Any other feedback or comments?).

2.4 Does new faculty attend the college-wide new faculty orientation?

Our two most recent hires (Fitzgerald and Cormier) attended new faculty orientation offerings for the first two years

2.5 Please compare outcomes with the college and division for each subject

There were no particularly outstanding variations for the outcomes for the three departments. They are summarized below.

Astronomy
The astronomy outcomes have remained steady from 2013 to 2018 and and stayed consistent with the division, college, and state averages.

Physical Science
The overall success rate of Physical Science has improved slightly from 2013 to 2018 and is similar to division, college, and state success rates. There has however been an increase in A's awarded in Physical Science. We believe this is not significant because the smaller enrollment in physical science leads to larger possible variation the the grade distribution.

Physics
The overall trend of physics has been a slight increase bringing it in line with the college-wide and state-wide averages, also bringing it slightly above the division average. The

trend of increased success rate the further along the PHYC 140 / PHYC 240 / PHYC 241 track is likely due to the fact that the stronger students make it further along. The same is true for the PHYC 130 / PHYC 131 track, which is that the second course has a higher success rate because students who did not succeed in the first one did not make it to the second one, or they improved.

2.6 We understand that your department does offer distance education courses. Please explain your "not applicable" response and provide missing information.

We teach ASTR 110, ASTR 120, PSC 110, as either hybrid or online. We do not have data to compare their success rates with in-person courses. Until recently, only one professor taught most of the online courses and there has not been a department wide policy but we are in the process of putting one together now.

2.8 Please include the letter from the Articulation officer and add to appendix 4

The missing file is attached

3.4 Please comment on existing SLO data and how you used it to inform your teaching. Please add SLO data for Astronomy 110 and PSC 120 to the appendices.

For SLO #4 for Astronomy 110, we asked the following 5 questions:

1) How does the distance between the galaxies in the Universe change with time?
   a) Mutual gravitational attraction of all objects in the Universe means that all galaxies are approaching each other.
   b) All galaxies are moving apart from each other; the more distant they are from each other, the faster they move apart.
   c) All galaxies are moving apart from each other; the closer they are to each other, the faster they move apart.
   d) The motion of galaxies in the Universe is random, towards and away from each other.

109/155 students were correct (70%)

2) In an image of a random patch of sky taken by the Hubble space telescope, more distant galaxies typically _____ than those nearby.
   a) appear older
   b) appear about the same age
   c) appear younger
   d) appear half older and half younger

62/155 students were correct (40%)

3) How does the abundance of elements heavier than helium observed in the gas between the stars in the spiral arms of our galaxy change with time?

a) It changes randomly with time.
b) It stays the same over time.
c) It decreases with time.
d) It increases with time.

55/155 students were correct (35%)

4) How is the length of a star's lifetime related to the mass of the star?

a) Higher-mass stars run through their fuel faster and have shorter lifetimes.
b) Lower-mass stars run through their fuel faster and have shorter lifetimes.
c) A star's lifetime does not depend on its mass.
d) The lifetimes of stars are too long to measure, so it is not known how (or if) their lifetimes depend on mass.

138/155 students were correct (89%)

5) How do stars like the Sun change as they evolve with time?

a) The lives of stars are so long that we do not know how they change with time.
b) Stars remain the same from birth to death.
c) Stars change in size, internal composition, and internal structure in response to internal nuclear processes.
d) Stars change in size, internal composition, and internal structure in response to collisions with other stars and interstellar clouds.

134/155 students were correct (86%)

Mean score for all Astronomy 110 students = 64%

SLOs for PSC 120 (note: mean score was 0.725 or 72.5%)

Student 1	0.833333333
Student 2	0.583333333
Student 3	0
Student 4	0.95
Student 5	0.916666667
Student 6	0.583333333
Student 7	0.833333333
Student 8	0.833333333

Student 9	0.916666667
Student 10	0.75
Student 11	0.75
Student 12	0.75

4.2 Is there a formal proposal already in circulation for renovating the observatory facilities? If so, how current is it?

We have made proposals for the observatory but they have been either rejected, ignored, or the estimated cost was much higher than it should be (high enough where the school would not pay for it).

4.4 What specific updated equipment is needed for Physics/Physical science labs? When was the last time the department submitted a request for this updated software and equipment? How many students are usually without equipment in labs?

Here is our 5 year wish list that was submitted Fall 2019 (all of which is needed to either replace what we have already or to bring us into compliance with CA Ed Code regarding labs):

4 computers in 34-108 to replace broken

printer for lab use in 34-108

20 e/m tube apparatus pasco SE-9629

10 resonance tubes

10 dynamics tracks, pasco ME-6954

10 dynamics carts, pasco ME-9454

20 Gas Exciters (for hydrogen gas tubes)

40 Hydrogen Gas tubes

40 Neon Gas Tubes

40 5000 lines/in diffraction gratings

40 10000 lines/in diffraction gratings

20 Force sensors, PS-3202

20 temp sensors, PS-3201

10 van de graaf apparatus

20 Digital Multimeters

10 NIST cert therm

10 digital O'scopes

10 BK 9110 power supplies

10 electron diffraction tube apparatus

20 string vibrator - WA-9857

10 photo electric effect SE-6609

10 optics benches and accessories - pasco os8515C

20 slotted weight sets

20 table clamps

Matlab license for all computers in 34-108

Mathematica License for all computers in 34-108

2 projector bulbs

planetarium replacement dome

planetarium media master drive update

repairs/upgrades to planetarium hardware

4 replacement 10" meade telescopes

2 Dobsonian telescopes

tripod for 16in LX-200 telescope

20 gauss meters model VGM

10 electrometers - pasco EX-9078A

10 heat engines - pasco TD 8572

20 stop watches - pasco ME-1245

6 8kilo digital scales Ohous

20 projectile launchers ME-6800

20 packs of iron projectiles

20 packs of plum bobs

20 packs of carbon paper

20 packs of plastic balls

10 sets of tuning forks

20 1-meter sticks

20 2-meter sticks

25 laser pointers

20 polarization sheet sets

Because of our lack of equipment, we are not able to supply all students with hands-on experience and have to resort to groups of 3-4 students per lab setup (note: our labs can have up to 32 students).

4.6 Regarding storage: is there outdated equipment to be purged that could free up space? Regarding equipment security: is this expensive equipment insured? Can equipment be stored in a more secure location (such as campus stockroom?)

Anything that is outdated and could be purged needs to be replaced because we are still using them regularly in labs. We will purge older equipment once it is replaced

5.0 Please include the missing data (resent to you today) in the appendices and your interpretation in section 5.2

5.2 Please look again at the data you were provided-it is disaggregated and there are some positive outcomes you may want to highlight

> Discuss trends in student success and retention overall in your department and explain these trends (e.g. campus conditions, department practices). Also examine the success and retention data disaggregated by gender, age and ethnicity. For any groups that have success rates in your department at lower or higher than college-wide describe what factors you think cause those patterns. Provide examples of any changes you made to improve student success/retention, especially for groups that have equity gaps. [Data and a summary of notable patterns will be provided by the Program Review Data Liaison]

Overall the trends in success rates for all three parts of our department are consistent with division, college, and state trends. Some more details for each part are provided below. Data provided on Outcomes did not disaggregate by gender, age and ethnicity which we take to mean there were no interesting trends their either

Astronomy

Astronomy retention has remained remarkably consistent with Division, College, and state trends throughout the past five years. There has been a small drop in A's awarded but it the overall

success rate is consistent. Female and male success rates are similar to each other. Astronomy success rate is steady across all age groups. Outcome for Asian and white ethnicities is slightly higher than other ethnicities.

Physics
Over the course of the program review time frame the physics success and retention rate has improved to become similar to Division, College, and State rates. Female and male success rates are similar to each other. Success rate is steady across all age groups. Our success rates across all ethnicities are very similar to each other and in particular black and "two or more races" results have improved in the past four years. We have accomplished this by having a new faculty (Cormier) take over a large fraction of those courses and help provide more consistency across the board.

Physical Science
Physical Science retention has remained consistent with Division trends but remains cons retention has remained remarkably consistent with Division, College, and state trends throughout the past five years. Female and male success rates are similar to each other. Success rates by age are similar across all age groups. For Black and Hispanic students, student success has improved over the last 4 years.

5.3 Please describe the innovative techniques that Prof. Fitzgerald uses in the classroom to increase student interaction and involvement in his Astronomy classes and how these have led to increased student success. (Your Dean shared with us- we'd like to hear more)

Please elaborate about the online learning platform developed by Prof. Carter and how it has impacted student success. How has the platform improved student-student and student-faculty interactions? (Another bit of information shared by your Dean, important also to the improvement recommendations made by ACCJC)

Professor Fitzgerald uses a teaching technique that is more learner centered and focused on student engagement. One of the activities is to give students think-pair-share questions like the following:

What causes the day/night cycle to occur?

A. The Earth is fixed in space, and the stars move around Earth.

B. The Earth is spinning about its axis.

C. The Earth moving around the Moon.

D. The Sun moving around the Earth.

He explains the rules of the think-pair-share questions (i.e. fold their ABCD card to the correct answer, do not talk to your neighbor, do not use resources to answer the question, and vote anonymously) and the importance of the think-pair-share questions (i.e. the questions are

possible exam questions, to check that the class is understanding the material, and to have students learn to interact with others in the class). Students have stated that having these questions in class (as well as on Canvas) help them to focus on the important topics in astronomy. Another technique that he uses in order to improve engagement was group work. He used to give a lot of homework assignments and handouts during class where students would work alone. Now he has his students do online homework and also work in pairs with their in-class exercises/handouts. Students seem more engaged and as a result grades are better. Also as a bonus students have another resource/study partner if they need help on a particular subject or concept. He has noticed that many students will join with others that they meet in class to plan study sessions. Ultimately Professor Fitzgerald wants students to know each other and feel comfortable around others in order to improve student retention as well as student success and engagement.

Professor Carter as well as other members of our department uses a variety of online platforms to achieve success in our courses which include but are not limited to the following: Mastering Physics, Mastering Astronomy, Sapling Learning, Wileyplus, Webassign, and Stemplosion. The latter has had a large input from Professor Carter. Coupled with canvas resources such as the discussion board and chat, students have been encouraged through syllabi incentives to engage in cooperative learning as well as communication with the instructor. The immediate feedback from such websites has been a great asset compared to traditional paper and pencil assignments where grading was not contemporaneous.

6.2 The "reports" from students and the success of tutors (being extremely helpful and alleviating the apprehension of science classes): Is there documentation of this or simply overheard feedback? Any documentation would be great to add.

There is no documentation on this. It is informal feedback given from students who have used the tutoring and been happy with the help and convenience of having this tutoring option.

6.3 What is the protocol for computer replacement (I.e. dept. member waiting for hard drive replacement for extended period of time).

There does not seem to be any protocol other than reporting the issue and having a minimal unsatisfactory replacement made to temporarily give minimal use of the computer. We needed to replace a faculty hard drive - a 3 Terabyte hard drive - and the replacement was with a defective 500 gigabyte drive. Needless to say, the 500 gigabyte drive being 1/6th the size of the original computer's hard drive was completely used up by the system and office applications. Immediately the computer started to show "hard drive full" messages. This limited use for email or any storage of work. In addition to losing 3 TB of valuable data required for the planetarium, the computer was down for 3 1/2 months as we attempted to purchase a $200 hard drive replacement that was recommended by Sang Bai. Unfortunately, no procedure was in place for

timely response. We had the department funds available, we had foundation money available, we even had LCE money we could transfer to cover the cost - the only problem is no one wanted to say yes. At one point in November 2019, we were given a 10 page draft document that expected us to explain how this purchase increased student equity and success across the department. This document would then go to a meeting in mid February 2020 for approval. This was not a joke, and attempts to contact those decimating the document by phone yielded the same response. Eventually as an email chain broadened in recipients we had a VP actually read the details of the request and give support and approval. Unfortunately it took another month on workday to obtain the replacement with approval (and possibly 3 quotes). When the hard drive arrived during flex week in January 2020, Sang Bai was out on vacation. The computer took another week to get back to a working state.

7.0 Which on-campus governance activities, committees, and professional development activities do your faculty participate in? Please list on your table.

Brian Carter – TTLC, Academic Senate, Tutoring Task Force

Philip Blanco – Academic Senate, Data Science Certificate Task Force, Programmable Logic Controller Task Force

Sebastien Cormier – Curriculum Committee, Academic Senate Officer at Large

Brodney Fitzgerald – Faculty Staffing Prioritization Committee Co-chair, Academic Senate, Tutoring Task Force

Professional Development for our departments: many workshops (e.g. NASA/Center for Astronomy Education Regional Teaching Exchange, equity workshops, Southern California American Association of Physics Teachers conferences, Online Teaching Conferences, Canvas workshops)

7.3 Please provide a list of professional development activities (as opposed to outreach) faculty have attended and how they impacted student success. Specifically, list ways. How are the "outreach opportunities" impacting student success?

For most of the outreach opportunities, the information is presented in the classroom. For the outreach at the elementary schools, our hope is to encourage future students to attend Grossmont College or at the very least be introduced to science and hopefully open their minds. We are currently working with Cuyamaca on improving the experience of students at both colleges.

Blanco attends and presents at Amer. Assoc. Phys. Teach. meetings (held twice yearly, plus smaller local workshops). Blanco and Fitzgerald also attend an annual Astronomy Teaching Exchange at Miracosta College.

In 2019 Blanco attended a computational physics conferemce (PICUP) to learn the VPython language and exchange ideas on implementing computation in the physics classroom.

The paltry $500 / year travel stipend from the Professional Development Committee is insufficient for all department members to participate in conferences showcasing the latest pedagogical techniques for engaging a diverse student population in the physical sciences.

8.2 Section 8.1 describes student demand "has been reduced slightly" while in section 8.2 the justification for drop in WSCH/FTEF is due to an increased demand in courses.

Which is it?

Reduced slightly in physical sciences but increased in physics and astronomy

8.3 What other types of funding have been pursued to meet the needs of your department for outreach to elementary schools?

Foundation accounts

8.5 Please describe the difference in roles for full-time vs. part-time faculty

Part time - encouraged to attend department meetings, encouraged to state their opinion on department matters such as scheduling and equipment, encouraged to bring new ideas to the department, expected to follow the format given in the course outlines and SLOs
Full time - expected to attend department meetings, mentor new faculty (e.g. show where to find important campus offices, give example syllabi and course outlines, etc.), participate in governance, discuss pressing issues in the department (e.g. computer and room related issues, student complaints, outreach events, etc.)

9.1 What is a reasonable retention rate for each course?

The astronomy retention rate in 2017 was 79.8% for Fall, 85.9% for Spring and 91.9% for Summer. These numbers are in line with the college targets of 85%.

The physical science retention rate in 2017 was 85.9% for Fall, 88.7% for Spring and 81.3% for Summer which is on average higher that the college target.

The physics retention rate in 2017 was 86.1% for Fall, 88.4% for Spring and 90.4% for Summer which is on average higher that the college target.

9.2 What kinds or engagement strategies are you currently using? How do you know if they are working?

Response (you can repeat what I wrote in 2.2 and 5.3)...they are working because we have successful and engaged students who are interested in our classes

9.3 What evidence do you have that an Associate's Degree for Transfer will be supported by enrollment?

It would be a unique feature since it would be the only community college in the District to have an Astronomy degree for Transfer and an Associate's Degree.

9.4 The list should be rank ordered. Please number the list in order of priority and state specifically state how you intend to work toward meeting them.

1. Hire at least one additional faculty to relieve the overworked full time faculty
2. Continue to seek funding for updating our out-of-date lab equipment
3. Continue to increase student success
4. Continue to try to reduce equity gaps
5. Conduct more outreach opportunities on campus and off campus
6. Attend more professional development workshops on outreach, engagement, and retention
7. Recruit more students in the Physics degrees
8. Establish an Astronomy degree (Associate or ADT)

GROSSMONT COLLEGE
SPRING 2020 **PHYSICS, ASTRONOMY, & PHYSICAL SCIENCES**

PROGRAM REVIEW COMMITTEE
SUMMARY EVALUATION

The committee recommends maintaining this program. Following are the committee's specific commendations and recommendations.

The Program Review Committee commends the department for:

1. Aligning calculus based Physics with Cuyamaca College to reduce student barriers and create a seamless student experience in the district
2. Employing student engagement strategies which improved student success in Physics
3. Creating distant education courses with rigor and multiple platforms to improve student outcomes
4. Commitment to the SLO process and entering data into TracDat
5. Improved outcomes in Astronomy and in Physical Sciences despite competition from other GE courses
6. Increase in AS-T degrees from 3 (2013/14) to 24 (2017/18)

Committee recommends the following:

1. Ensure SLO data is used to inform teaching, track changes, and assess effectiveness of changes to the SLOs
2. Develop a formal training on successful student engagement strategies to share with faculty, including part-time and/or adjunct
3. Develop and implement a plan to document where students gain employment related to your courses.
4. Work with your Dean to update and formalize a proposal to address the observatory
5. Increase marketing efforts on campus to highlight the value of your departments

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_____	_____	_____
College President	Program or Department Chair	Academic Program Review Chair

PHYSICS, ASTRONOMY, & PHYSICAL SCIENCES

Academic Year	Fall		Spring	
	% Fill	WSCH/FTEF	% Fill	WSCH/FTEF
2013-14	94.9	612.3	92.9	609.2
2014-15	90.1	592.3	87.0	561.4
2015-16	82.4	528.7	78.8	508.0
2016-17	67.9	454.1	66.3	439.6
2017-18	67.9	443.9	68.8	440.2