Program Review - Academic - Engineering/Physics/Physical Science

Latest Version

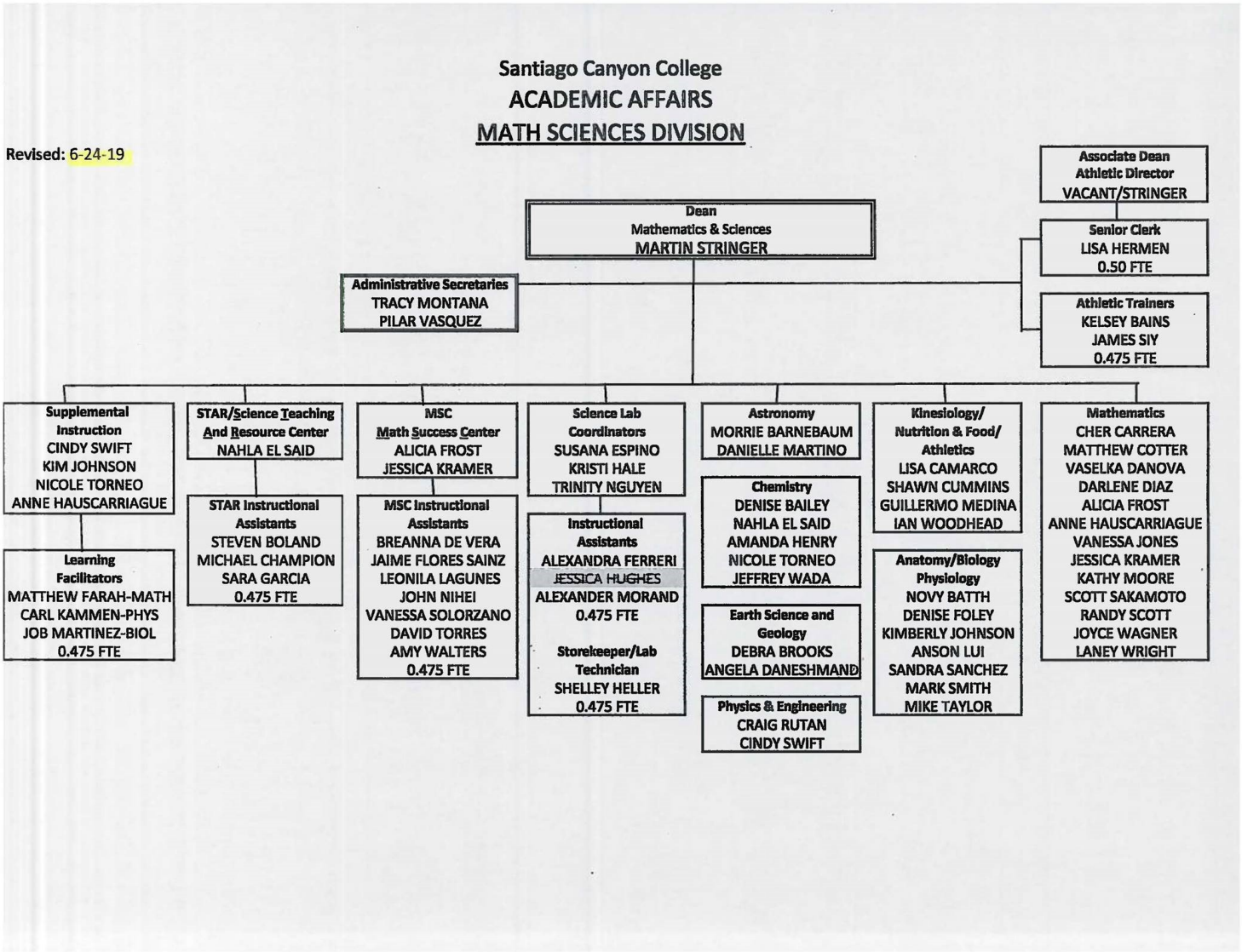
Overview

Program Review - Collaborators : Version by **Rutan, Craig** on **11/22/2019 02:18**

Collaborators
Cynthia Swift

Program Review Overview - Organizational Chart : Version by **Rutan, Craig** on **11/22/2019 02:18**

Please insert the organizational chart for this program or service area.



Program Review Overview - Award Programs : Version by **Rutan, Craig** on **11/22/2019 02:18**

The physics program has proposed a new degree program that will be offered beginning in Fall 2020. This degree is aligned to the University of California Transfer Pathway (UCTP) in physics and students completing this degree that meet certain GPA requirements will be guaranteed admission into the University of California system.

Physical sciences does not have a degree or certificate program. The single physical sciences course that is offered is required for the Associate in Arts for Transfer in Elementary Education.

There is no degree or certificate program in Engineering.

Award Programs
Physics AS-T

Program Review Overview - Course Offerings: Unique Courses : Version by **Rutan, Craig** on **11/22/2019 02:18**

The couree offerngs in physics and physical sciences is unlikely to change in the near future. The courses offered meet the tranfer needs of general education, elementary education majors, biological sciences majors, and phyical sciences and engineering majors.

In 2018-19, two of the three unique engineering courses were offered. Until the enrollment in those two courses, Statics and Dynamics, is more robust and stable, there is no plan to offerer Electric Circuits because it is a more specialized course that will only contain a subset of the students enrolled in the other two courses.

Unique Courses in 2014-2015	Unique Courses in 2015-2016	Unique Courses in 2016-2017	Unique Courses in 2017-2018
Physics: 8	Physics: 8	Physics: 8	Physics: 8
Physical Science: 1	Physical Science: 1	Physical Science: 1	Physical Science: 1
Engineering: 0	Engineering: 0	Engineering: 0	Engineering: 1

Program Review Overview - Course Offerings - Number of Sections Offered : Version by **Rutan, Craig** on **11/22/2019 02:18**

Number of Sections Offered	2014-2015	2015-2016	2016-2017	2017-2018
Physics Face to Face	17	19	19	19
Physical Sciences Face to Face	1	1	1	1
Engineering Face to Face	0	0	0	1

Program Review Overview - Course Offerings - Total Enrollment : Version by **Rutan, Craig** on **11/22/2019 02:18**

Total Enrollment (Seats Filled)	2014-2015	2015-2016	2016-2017	2017-2018
Physics	359	485	411	401
Physical Sciences	16	25	18	27
Engineering	0	0	0	8

Program Review Overview - Course Offerings - Students per Offered Section : Version by **Rutan, Craig** on **11/22/2019 02:18**

Students per Section	2014-2015	2015-2016	2016-2017	2017-2018
Physics	21	25	22	21
Physical Sciences	16	25	18	27
Engineering	0	0	0	8

Program Review Overview - Faculty Workload LHE : Version by **Rutan, Craig** on **11/22/2019 02:18**

Please note that the data presented is for the last year of the program review cycle (2017-18). The single engineering course offered in 2017-18 was taught by Dr. Craig Takahashi, full time engineering faculty at SAC. Beginning with the spring of 2019, SCC engineering courses are being taught by part-time faculty.

Full-time LHE #	Full-time LHE %	Part-time LHE #	Part-time LHE	Overload LHE #	Overload LHE %	Total LHE #	Total LHE %
Physics: 40	Physics: 43.48 %	Physics: 44	Physics: 47.83%	Physics: 8	Physics: 8.70%	Physics: 96.0	Physics: 100 %
Physical Sciences: 0.0	Physical Sciences: 0.0 %	Physical Sciences: 5.7	Physical Sciences: 100 %	Physical Sciences: 0.0	Physical Sciences: 0.0 %	Physical Sciences: 5.7	Physical Sciences: 100 %
Engineering: 0.0	Engineering: 0.0 %	Engineering: 0.0	Engineering: 0.0 %	Engineering: 3.0	Engineering: 100 %	Engineering: 3.0	Engineering: 100 %

Program Review Overview - Faculty Workload Faculty Headcount : Version by **Rutan, Craig** on **11/22/2019 02:18**

Please note that the data presented is for the last year of the program review cycle (2017-18). The single engineering course offered in 2017-18 was taught by Dr. Craig Takahashi, full time engineering faculty at SAC. Beginning with the spring of 2019, SCC engineering courses are being taught by part-time faculty.

Full-time Faculty Headcount	Part-time Faculty Headcount	Overload Faculty Headcount	Total Faculty Headcount
Physics: 2	Physics: 3	Physics: 2	Physics: 5

Full-time Faculty Headcount	Part-time Faculty Headcount	Overload Faculty Headcount	Total Faculty Headcount
Physical Sciences: 0	Physical Sciences: 1	Physical Sciences: 0	Physical Sciences: 1
Engineering: 0	Engineering: 0	Engineering: 1	

Program Review Overview - Faculty Workload LHE per Faculty : Version by **Rutan, Craig** on **11/22/2019 02:18**

Please note that the data presented is for the last year of the program review cycle (2017-18). The single engineering course offered in 2017-18 was taught by Dr. Craig Takahashi, full time engineering faculty at SAC. Beginning with the spring of 2019, SCC engineering courses are being taught by part-time faculty.

Full-time LHE per Faculty	Part-time LHE per Faculty	Overload LHE per Faculty	Total LHE per Faculty
Physics: 20.0	Physics: 14.67	Physics 4.00	Physics: 18.40
Physical Sciences: 0.0	Physical Sciences: 5.7	Physical Sciences: 0.0	Physical Sciences: 5.7
Engineering: 0.0	Engineering: 0.0	Engineering: 3.0	Engineering: 3.0

Program Review Overview - Faculty Workload FTEF (LHE/30) : Version by **Rutan, Craig** on **11/22/2019 02:18**

Please note that the data presented is for the last year of the program review cycle (2017-18). The single engineering course offered in 2017-18 was taught by Dr. Craig Takahashi, full time engineering faculty at SAC. Beginning with the spring of 2019, SCC engineering courses are being taught by part-time faculty.

Full-time FTEF	Part-time FTEF	Overload FTEF	Total FTEF
Physics: 1.33	Physics: 1.47	Physics: 0.27	Physics: 3.07
Physical Sciences: 0.0	Physical Sciences: 0.19	Physical Sciences: 0.0	Physical Sciences: 0.19
Engineering: 0.00	Engineering: 0.00	Engineering: 0.10	

Program Review Overview - Faculty Workload FTES and Efficiency : Version by **Rutan, Craig** on **11/22/2019 02:18**

Please note that the data presented is for the last year of the program review cycle (2017-18).

Total FTES	Overall Efficiency (FTES/FTEF)
Physics 110.10	Physics 35.86
Physical Sciences: 6.24	Physical Sciences: 32.84
Engineering: 1.18	

Goals and Objectives

Program Review Goals & Objectives - Process and Mission Statement Alignment : Version by **Rutan, Craig** on **11/22/2019 02:18**

What processes does your program/service area follow to create, evaluate, and update annual plan goals?
The goals and activities listed in the DPP are reviewed at the beginning of each academic year. These goals were developed after looking at the program's course assessment data, course completion rates, class fill rates, and degree completion data. When reviewing the course assessment data each semester, new activities are considered that might enhance the program's progress towards meeting its goals. As the program has continued to expand, different objectives have been developed but the overall goals of the program have remained the same.

How is SCC's mission statement (https://www.sccollege.edu/About/Pages/CollegeMissionStatement.aspx) reflected in your goals?
Our goals are about improving the skills of our students and improving their ability to achieve their transfer and degree completion goals. As we strive to improve their problem solving and data analysis skills, we improve their ability to learn and think critically, while providing them will skills that they will be able to apply to future courses and their future careers. Additionally, improving laboratory skills will improve the ability of students to work collaboratively and to communicate the results of their work.

Program Review Goals & Objectives - Annual Plan Goals Not Aligned with EMP Goals

Annual Plan Goal
undefined

Data Analysis

Program Review Data Analysis - 1 to 4 : Version by **Rutan, Craig** on **11/22/2019 02:18**

What is the successful course completion rate (grades of A, B, C, Credit or Pass) for courses within the program and how does this compare to the institution-set standard for successful course completion of **63%**?

Discipline	2014-15	2015-16	2016-17	2017-18
Physics	78.2%	86.3 %	76.9 %	77.1%
Physicsl Science	69.6 %	77.8 %	90.0 %	89.7 %
Engineering	-	-	-	63.6 %

Physics success rates have consistentently been around 75% for many years. The physical sciecnes success rates remain above the institution set standard despite offering only one section each year. It is too soon to know how engineering success rates will look relative to the institution set standard.
What is the successful course completion rate in basic skills courses (grades of A, B, C, Credit or Pass) within the program?
Not Applicable
What is the course retention rate (any grade except W) for courses within the program?

Discipline	2014-15	2015-16	2016-17	2017-18
Physics	84.7 %	90.8 %	85.2 %	83.8 %
Physicsl Science	69.6 %	92.6 %	90.0 %	93.1 %
Engineering	-	-	-	72.7 %

All of the retention rates continue to look strong. Students enrolled in most of these courses are required to take those specific courses for their major, so they tend to be less likely to drop the course during the semester.
What is the course retention rate in basic skills courses (any grade except W) within the program?
Not applicable

Program Review Data Analysis - 5 : Version by **Rutan, Craig** on **11/22/2019 02:18**

The program hopes to have a new degree for physcs majors hoping to transfer to a UC campus during the next program review cycle. There are no plans to develop an engineering degree during the next program review cycle, but it could be developed in the future if there is student demand.

Number of Awards in the Following Programs:	2014-2015	2015-2016	2016-2017	2017-2018
Physics, AS-T	18	35	38	43

Program Review Data Analysis - 6 to 13 : Version by **Rutan, Craig** on **11/22/2019 02:18**

Are there any patterns, trends, or anomalies in the Student Demographic Data (Ethnicity, Age, Gender, Veteran Status, etc.)?
Physics

Group	14-15	15-16	16-17	17-18
Male	70.8	73.2	73.2	73.8
Female	70.3	72.9	73.0	74.4
White	82.7	89.1	82.3	84.9
LatinX	73.0	79.0	70.3	69.4
African American	60.0	75.0	100	80
Asian	82.1	92.9	76.6	82.6

Physical Sciences

Group	14-15	15-16	16-17	17-18
Male	62.5	66.7	100	88.9
Female	73.3	83.3	86.7	90.0
White	76.9	85.7	100	90.9
LatinX	40.0	71.4	88.9	86.7
Asian	100	100	N/A	N/A

The examinatioh of the physical sciences data does not show any disturbing trends. The data set is small (only one section offered each year), but it is positive to see an increase in the performance of LatinX student since 2014-15. All groups are succeeding at a higher rate than the institution set standard for course success.

There may be an issue with the physics performance of LatinX students. These students reached a 79 % success rate (compared to the 89.1% rate for White students) in 2015-16; however, they only succeeded at 69.4 % rate (compared to 84.9 % for White students) in 2017-18. While other demographic groups have also seen a drop in success rates since supplemental instruction was lost for physics, it is possible that the LatinX students are experiencing the largest impact. This will need to continue to be monitored to ensure there isn't a disproportionate impact on these students.

With only one section offered, it is too soon to examine any trends for engineering students.

Labor market trends and needs: Review the labor market data on the California Employment Development Department (http://www.labormarketinfo.edd.ca.gov/Content.asp?pageid=1011) website for jobs related to your program.

1. What occupations are related to your program?
2. What are the occupational projections for employment?
3. How do these projections affect planning for your program?

Physics

1. Physicist – projected growth of 18.4%
2. Physics Teacher – projected growth of 15.4 %

3. Atmospheric/Space Sciences Teacher – projected growth of 10.5 %
4. Biological Science Teacher – projected growth of 17.5 %
5. Chemical Engineer – projected growth of 21.7 %
6. Education Administrator – projected growth of 15.8 %
7. Engineering Teachers – projected growth of 11.1 %
8. Geoscientists – projected growth of 22.4 %
9. Mathematical Science Teachers – projected growth of 8.6 %
10. Occupational Health and Safety Specialists – projected growth of 23.6 %
11. Philosophy and Religion Teachers – projected growth of 20.8 %
12. Secondary School Teachers – projected growth of 6.5 %
13. Soil and Plan Scientist – projected growth of 35.0 %

Engineering

1. Aerospace Engineering – 13.3 % growth
2. Biomedical Engineers – 67.5 % growth
3. Chemical Engineers – 15.8 % growth
4. Civil Engineers – 12.6 % growth
5. Computer and Information Research Scientists – 19 % growth
6. Computer Programmers – 10.8 % growth
7. Computer Systems Analysts – 17.8 % growth
8. Electrical and Electronic Drafters – 10 % growth
9. Electronics Engineers – 12.9 % growth
10. Engineering Teachers – 12.9 % growth
11. Engineers, All Other – 11.9 % growth
12. Environmental Engineers – 25 % growth
13. Industrial Engineers – 11.1 % growth
14. Materials Engineers – 17.2 % growth
15. Mechanical Drafters – 10.4 % growth
16. Mechanical Engineers – 9.8 % growth
17. Sales Engineers – 23.5 % growth
18. Semiconductor Processors – 2.3 % growth
19. Software Developers, Applications – 27.7 % growth
20. Software Developers, Systems Software – 31.9 % growth

The program has been designed to support the needs of transfer students in STEM and for future elementary school teachers. There continues to be a need for elementary teachers and there is increased need for physics teachers with the adoption of the new California Science Standards that encourage students to take physics during high school. The top growth fields in STEM are in biotechnology and computer science. The number of computer science majors enrolling in Physics 250ABC has increased since the last program review cycle, with some students required to take all three semesters and others only being required to take the first two. The number of students enrolling in Physics 150AB has increased since the last cycle, so it appears that this sequence is continuing to meet the needs of biology majors. Ideally, the program would see greater enrollment in engineering courses, but it has been difficult to get these courses started at SCC. The college will need to determine how to increase enrollment in these courses to ensure that students do not feel like they need to enroll at other local campuses to meet their transfrer needs.

Please provide comment on the rates of progress through the basic skills course sequence within your program using the California Community College Chancellor's Office Data Mart Basic Skills Progress Tracker (http://datamart.cccco.edu/Outcomes/BasicSkills_Cohort_Tracker.aspx).
Not applicable
Please provide comment on student survey results administered by the program, if any.
The program does not give any surveys to students.
Please provide comment on program exit exams or other assessments of graduating students, if any.
Students are not given any exit exams or other assessments.
Please provide the number of students who take and pass external license examinations, if relevant to the program.

There are no external license exams for the program.
Please provide data on former students' post-SCC experiences (e.g. transfer success, career advances, post-graduation surveys), if any.
With the exception of physics 100, physics students transfer at a nearly 100% rate and are tranferring to universities like the University of California Berkeley, Los Angeles, San Diego, and Irvine. The most popular campuses (based on communication with students) are Cal Poly Pomona, UCLA, UCSD, and UCI.
Please provide data pertaining to the instruction or delivery of service, if any.
No data is available.

Outcomes Assessment

Program Review Outcomes Assessment - Course and Section Count : Version by **Rutan, Craig** on **11/22/2019 02:18**

Courses	Section Count

Program Review Outcomes Assessment - CSLOs : Version by **Rutan, Craig** on **11/22/2019 02:18**

Student Learning Outcomes	CSLO Count	CSLOs Measured
ENGR220 - Statics		
Analyze and solve equilibrium conditions for a particle, rigid body, or a beam in two or three dimensions.		

Student Learning Outcomes	CSLO Count	CSLOs Measured
Determine and diagram the forces acting on a particle or rigid body in two or three dimensions.		
PHYS100 - Conceptual Physics		
Correctly analyze natural phenomena using the concepts of physics.		
Investigate physical phenomena using appropriate equipment and methods, make valid comparisons with theoretical predictions, and communicate those results.		
PHYS150B - Introductory Physics II		
Analyze and solve problems using the concepts and mathematical equations of electricity and magnetism, light, special relativity, and quantum mechanics.		
Investigate physical phenomena using appropriate equipment and methods, make valid comparisons with theoretical predictions, and communicate those results.		
PHYS250A - Physics for Scientists and Engineers I		
Analyze and solve problems using the concepts and mathematical equations of mechanics.		
Investigate physical phenomena using appropriate equipment and methods, make valid comparisons with theoretical predictions, and communicate those results.		
PHYS250B - Physics for Scientists and Engineers II		
Systematically analyze problems involving thermodynamic and electromagnetic phenomena by applying one or more problem solving techniques including calculus, conservation laws, and Maxwell's equations.		
Investigate physical phenomena using appropriate equipment and methods, make valid comparisons with theoretical predictions, and communicate those results.		
PHYS250C - Physics for Scientists and Engineers III		
Systematically analyze problems involving wave phenomena by applying one or more problem solving techniques, including calculus and various wave equations.		
Investigate physical phenomena using appropriate equipment and methods, make valid comparisons with theoretical predictions, and communicate those results.		
PHYS150BC - Introductory Physics II - Calculus		
Analyze and solve physics problems involving electric current, electromagnetic induction, and wave equations using differential calculus.		
Analyze and solve physics problem involving electric fields, magnetic fields, and probability using integral calculus.		

Program Review Outcomes Assessment - PSLOs : Version by **Rutan, Craig** on **11/22/2019 02:18**

Program Student Learning Outcomes	PSLO Count	PSLOs Measured
Physics*		
Physics, AS-T		
Apply appropriate physical laws and mathematical techniques to analyze various physical situations.		
Perform various scientific experiments and analyze data to check agreement with theoretical predictions.		

Program Review Outcomes Assessment - Assessment of CSLOs and PSLOs : Version by **Rutan, Craig** on **11/22/2019 02:18**

How does the program/service area systematically assess student learning outcomes and/or service area outcomes using specific and measurable performance criteria?
The SLOs for the physics program are broken into two categories, one for problem solving and one for laboratory. The means of assessment vary, but a score of 70% on an individual assessment indicates that the student was successful and 70% of the students in a course, reaching the success threshold, is required for a section to be successful.

Out lab SLOs are assessed through an assessment activity or a grading rubric used for each laboratory report. If an assessment activity is used, it is scored using a rubric, and a student must earn 70 % of the points to be successful. Our Physics 250A lab manual was reworked to incorporate a rubric into the grading of each laboratory report. This has allowed all of the reports to be used in the assessment of a student's success in meeting the outcome.

Our lecture SLOs are assessed through the use of embedded questions. If the embedded questions are multiple-choice, a successful student must answer at least 70% of those questions correctly to be successful. For course that use free response problems for assessment, each problem is scored with a rubric, the student must earn 70% of the possible assessment points to be successful in the course. As with other SLOs, 70% of the students need to be successful for a course to be considered successful.

What is your assessment cycle, how are assessments carried out, and who is involved in the assessment process?
Typically, the outcomes for each course are measured once a year. Each instructor is responsible for assessing their section and courses with multiple sessions will have their results aggregated if they are the same instructor or compared if they are taught by different instructors. In cases where the full time faculty are teaching a course in one semester and part time faculty are teaching it in the other, the full time faculty member is responsible for complete and submitting assessment data.
Upon review of *course student learning outcome assessment data*, give at least one specific example of:

1. A *course student learning outcome* which students have definitely met and why you think students were successful.
2. A *course student learning outcome* which students have definitely **not** met and why you think students were unsuccessful. What changes have you considered making?

Overall, physics and physical sciences have had several completion of all student learning outcomes for the last few years. The performance of physical sciences students tends to be the best of all students taking courses in the program and this could be related to having more integrated hands on activities than traditional lecture/laboratory courses that are common in physics. Even though students have been successful in meeting the courses stated outcomes, there are still concerns with how much students are retaining once a course has ended and they continue on to the next course in the sequence. This has been particuarly concerning for laboratory students in the 150 and 250 sequnces. Students are able to perform the experiments and the meet the course laboratory outcomes based upon the scoring rubric, but students do not seem to master important skills because they are more focused on learning new types of equipment for each experiment. There have been preliminary discussions about redoing one of the current laboratory manuals to hve the students complete multiple experiments on different aspects of the same physical phenomena to see if this improves the overall comprehension and retention of their work in lab. It is not clear if these revisions will be completed during the next program review cycle because there are no commercially available and one of the full time faculty has been 67% reassigned for several years.

Engineering courses have not been assessed yet. It is hoped that assessment will begin in spring 2020.
What changes has the program ***already*** made based on its assessment of *course student learning outcomes*? Give specific examples and describe how you know if the changes have increased success?
As reported in the last program review cycle, a couple of changes were made that lead to nearly 100% successful outcomes completion during this cycle. In the past, laboratory assessment was often based on a practicum where students would individually need to complete an experiment that was based on previous experiments and students often struggled to remember how to complete some, or all, of the steps. A scoring rubric was developed for each experiment to make scoring more consistent and communicate to students the areas where they need to focus. Since the rubric was introduced, students have performed better on individual experiments and the overall success of students in completing the laboratory outcome for each course has increased. As mentioned earlier, the students have done much better during each individual experiment, but their overall laboratory skill may not be building the way that we hope. So, even though the students have been more successful in an individual course, there may be more work to do to ensure they are successful in future laboratory courses.

The engineering courses have not been assessed yet and there will need to be several offerings before any changes can be considered.
Upon review of *program student learning outcome assessment data*, what patterns, trends, or anomalies did your program identify?
The program does not do any direct assessment of program learning outcomes, but the increase in the number of degrees issued is a positive and unexpected development. Students continue to transfer at a high rate and are succeeding at the baccalaureate level.

Curriculum and Program Management

Program Review - Curriculum and Program Management : Version by **Rutan, Craig** on **11/22/2019 02:18**

With ***SCC's Mission Statement*** in mind, explain how your program/service area meets the academic, developmental, and vocational needs of SCC's diverse student population?
The program offer courses, at several different levels of mathematical preparation, for students looking to meet their general education, transfer, and major preparation requirements. The program only offers face-to-face lecture and laboratory courses. The program previously offered online and hybrid instruction, but our retention results were poor and this mode of instruction was discontinued.

Physical Sciences 100 is a general physical science course designed to meet the needs of students hoping to become elementary school teachers. This inquiry-based course was specifically designed to align with the teacher education program at CSUF. It is part of SCC's Elementary Education AA-T and has been approved for C-ID designation PHYS 140/CHEM 140.

Physics 100 is an algebra based physics course that meets the needs of students looking to satisfy their GE requirements. This course is also very popular with psychology majors, who need to take a physics course prior to transferring.

Physics 150A and 150B is a two-semester, trigonometry based sequence for students majoring the biological sciences. It has two one-unit courses (150AC and 150BC) that provide these students with instruction on using calculus to solve the problems being covered in 150A/150B. Beginning in fall 2018, this course sequence has been offered as a hybrid to make it easier for students to enroll and it has seen an increase

Physics 250A/250B/250C is a three-semester, calculus-based sequence intended for students majoring in computer science, the physical sciences, and engineering.

The program offers an AS-T degree that guarantees students admission to the CSU system when they complete the degree and meet certain criteria. The program is in the process of deveoping a similar degree that will guarantee students admission into the UC system.

Does your program/service area offer sufficient courses, workshops or other services, with sufficient frequency, at appropriate times, and through appropriate delivery modes to meet the major requirements, transfer goals, and general education, co-curricular, and elective needs of the student body? If not, list what changes would help accomplish this.
The program has continued to meet student demand in all areas. There is a plan to offer physical sciences 100 and physics 250C in the fall and spring semesters if there is an increase in student demand. The shifting of physics 150AB from traditional face-to-face to hybrid has increased the overall enrollment and improved the ability of the program to meet the needs of students.
Does your program/service area offer learning opportunities that extend beyond the traditional classroom experience?
During the period of this program review, Professor Swift served as the faculty advisor for the STEM club that participated in and won the Rube Goldberg machine competition three times.

How do program/service area faculty and/or staff ***review the processes*** it uses to manage the curriculum and program, including the process of introducing new courses and/or workshops and services, the process of conducting quadrennial reviews for instruction, and the process of creating new programs and services?
The modification of existing or the creation of new courses is dictated by the requirements established at the UC and CSU campuses. When courses are up for review, existing articulation agreements are reviewed to ensure there aren't any gaps that need to be addressed.
How do program/service area faculty and/or staff coordinate activities with other college programs and services, including the Library? How do program/service area faculty and/or staff maintain their knowledge of other programs and services offered at SCC? If applicable, what contact does the program/service area have with outside advisory groups?
The faculty consult with counselors faculty to ensure that students receive accurate information about the courses offered and which ones would be best for them. We also make sure that all required course materials are on reserve at the SCC library. As we increase the number of sections in science courses, it has become difficult to avoid conflicts with other classes. Every effort is made to accommodate student schedules with offerings at SCC or SAC, but it is extremely challenging to anticipate all of the possible course combinations. One area were overlap is specifically avoided is with sections of the Mathematics courses that physics students are likely to be taking (Math 185, 280, 290, and 295). Additionally, the faculty have attempted to not conflict with SAC engineering offerings, but this has negatively impacted anrollment and the practice will be discontinued during the fall of 2020.
Upon consideration of the information you have presented in this section, what areas or issues will need attention from the program/service area in the next three years?
While the articulation of the electric circuits course has not been an issue, there are issues with both the statics and dynamics courses. These outlines will be revised by Professor Rutan in spring 2020 to address the changes requested by Cal Poly Pomona and C-ID.

Resources

Program Review Resources - Facilities Exclusive to Program/Service Area : Version by **Rutan, Craig** on **11/22/2019 02:18**

The physics laboratory rooms (SC 203 and SC 204) both have an attached storeroom that have been linked together to serve as a single storeroom. The laboratory rooms are primarily used by the physics, physical science, and engineering programs, but the rooms are used by other disciplines when they are not occupied. Each of the full time faculty have an office. Professor Swift shares her office with Professor El Said while Professor Rutan does not have a permanently office mate. Professor Rutan's office may be used by part time faculty in the Mathematics and Sciences division.

Classrooms	Labs	Offices	Storerooms	Conference Rooms
0	2	2	2	0

Program Review Resources - Facilities Shared with Other Programs/Service Areas : Version by **Rutan, Craig** on **11/22/2019 02:18**

Classrooms	Labs	Offices	Storerooms	Conference Rooms
2	0	0	0	0

Program Review Resources - Specialized Equipment and Resources : Version by **Rutan, Craig** on **11/22/2019 02:18**

34 Lenovo Tablet Computers (17 each for SC 203 and SC 204) - Not currently in use
16 Dell Laptop Computers
2 HP P2055dn Laser Printers
2 Lab Licenses for SMART Sync
8 Photoelectric Effect Apparatuses
8 Cenco Current Balances
8 BK Precision High Current Power Supplies
8 Prism Spectrometers
8 Geiger Counters with USB Interface
18 Pasco AC/DC Electronics Kits
10 Pasco Optics Kits
18 Pasco Smart Timers
10 Spectrum Tube Power Supplies
9 Pasco String Vibrators
9 Pasco Sine Wave Generators
16 Bench Digital Multi-Meters
18 Fluke True RMS Portable Digital Multi-Meters
9 Analog Oscilloscopes
9 Function Generators
18 Pasco Super Pulley Force Tables
9 Cenco Resonance Tubes
8 Pasco Resonance Tubes
18 DC Power Supplies
8 Centigram Balances
16 Digital Balances
10 Hot Plates
9 Hydrogen Fuel Cell Cars
8 Corning Hot Plates
1 Pasco Capstone Site License
8 Cenco Centripetal Force Apparatuses
10 Pasco Projectile Launchers
Photogate heads and cables for two simultaneous laboratory sections
Various clamps, rods, bases, and pulleys
Various Pasco USB Links and Sensors

Equipment/Resource	Description
undefined	undefined

Program Review Resources - Funding Sources : Version by **Rutan, Craig** on **11/22/2019 02:18**

Funding Source	Description
Restricted Lottery Funds	The physics/physical sciences receive lottery funds each year for supplies. The funding for this account had been stable until 2019-20 when the funding was reduced. Engineering has not had any supply costs and currently does not have any additional funding.

Program Review Resources : Version by **Rutan, Craig** on **11/22/2019 02:18**

How well do the facilities used by the program/service area meet its needs? Do facilities and equipment meet appropriate safety criteria?
The program has primary access to two laboratory rooms (SC 203 and 204) that have been sufficient to meet the programs needs. Several of the physics lectures have been moved out of the laboratory rooms into larger classrooms to accomodate enrollments as high as 64 students. By moving these lectures out of the laboratory rooms, some of the scheduling challenges that were anticipated for the labs have not materialized. There are a limited number of rooms in the Scence Center, but the program has not had to move lectures out of the Science Center so far. If program enrollment remains constnat or declines, then the current facilities should be sufficient, but there could be challenges if enrollement surges.
How sufficient are the program/service area's equipment, supplies, and materials? Does the program/service area have a budget and timeline for the purchase of needed equipment and supplies?
The program currently has all of the equipment that it needs to offer high quality laboratory instruction to students. In the next three years, the program hopes to rework some of the laboratory experiments and this could be dependent on additional equipment, but the current equipment can continue to be used for the immediate future.
How well do technology resources (i.e., computers, software, media and presentation equipment) meet the needs of the program/service area?
Prior to the Fall of 2019, the programs were using laptop computers that were originally purchased when the Science Center was under construction (2010). More than half of the individual laboratory experiments must have a computer interface to be completed and these laptops have had intermitent failures. In September 2019, 18 new HP laptops were ordered for the program that should be in service by spring 2020.
How well do technology resources (i.e., computers and software), training, and technical support meet the **administrative** needs of the program/service area?
The program has sufficient technology to support the program's administratiron (scheduling and ordering).
How adequate is staff support (provided by administrative assistants, lab assistants, learning facilitators, and instructional assistants, and other classified staff) to meet the instructional and operational needs of the program/service area?
The program has sufficient access to the administrative assistants from the administrative secretaries of the Mathematics and Sciences division. The program has also been fortunate to have a instructional assistant in the STAR Center thas has been vital in the support of student success. Without the support of the instructional assistant, we do not believe that the current level of students success would be possible. Students feel more comfortable working together with someone that is closer to a peer than coming for help from their instructor. This is not unique to SCC and is often seen at universities where students wil go to the teaching assistant for help first.

The program has been fortunate to have 6 hours/week of laboratory assistance, but the lack of permanent laboratory assistance is not ideal. The current hours are beneficial, but the individual assigned changes often, requiring weeks of training to get the new assistant up to speed. Additionally, there is no laboratory support during the summer session.Additionally, as mentioned earlier in this review, the program used to have access to supplemental instruction and that has been discontinued for physics. Ideally, the availability of SI for physics would be restored to, hopefully, address the declining student success of LatinX students.
Does your program/service area receive any categorical (Basic Skills, Student Equity, SSSP, Strong Workforce Program) and/or grant funding? If so, what major activities or resources has the funding allowed for? What impact has this had on your program/service area (address both positive *and* negative impacts)? If the college were to sustain these activities, which are critical to your program/service area and what would be required to institutionalize them?
The program does not receive any categorical funding.
Upon consideration of the information you have presented in this section, what areas or issues will need attention from the program/service area in the next three years?
With the procurement of the new HP computers, there are no material resources that are needed for the program to be successful in the next three years. The program does need human resources that will be discussed in the next section of this review.

Human Resources

Program Review Human Resources - Support Staff : Version by **Rutan, Craig** on **11/22/2019 02:18**

The program has access to a laboratory assistant for 6 hours each week from the Biology Department. Additionally, the program has access to a Physics Instructional Assistant in the STAR Center durig the fall, spring, and summer terms.

Title of Position	Count	Full-time or Part-time	Months per Year	Funding Source
Laboratory Assistant	1	Part Time	10	General
Instructional Assistant	1	Part Time	11	SEA Program

Program Review Human Resources : Version by **Rutan, Craig** on **11/22/2019 02:18**

What are faculty, staff, and administrators doing to remain current in knowledge of learning theory, counseling and student development theory, maintenance and operations practices, instructional strategies, and content? In which professional organizations and conferences do faculty, staff, and administrators participate?
Our faculty are members of the American Association of Physics Teachers and the American Physical Society to stay informed about new trends in physics education. Professor Rutan is also a member of the Institute of Electrical and Electronic Engineers. Professor Swift has been the lead SCC's Supplemental Instruction program and continues to work with other groups involved in supplemental instruction. Professor Rutan completed his time as faculty lead of the Faculty Discipline Review Group (FDRG) for Physics in the spring of 2018. That group is responsible for the physics course descriptors in the Course Identification Numbering (C-ID) project and is leading the five-year evaluation of the Physics Transfer Model Curriculum (TMC) and C-ID course descriptors. Additionally, Professor Rutan served on the University of California Transfer Task Force thas has been examining ways to improve student transfer from CCCs

to the UC and helped develop the UCTP pilot degree program for physics majors.

How do faculty, staff, and administrators participate in college-wide programs, shared governance bodies, and leadership activities? In what ways do faculty, staff, and administrators serve as resources for the community?
Professor Swift has continued to be involved with the annual Community Science Night, the STEM mentorship program, and the STEM scholarship program. During the time of this review, she was also in charge of SCC's Supplemental Instruction for STEM program. She is also the advisor for both the STEM Club and the Rube Goldberg Machine Building Team.. Professor Rutan currently serves on the Physical Resources Committee and serves on the the Planning and Organizational Effectiveness (POE) Committee for two years. In the past three years, Professor Rutan served as a member of the Executive Committee of the Academic Senate for California Community Colleges (Area D Representative 2015-18, Secretary 2018-19). During the time of this review, Professor Rutan chaired 5 Academic Senate institutes (Instructional Design and Innovation, Accreditation, Curriculum, Part Time Faculty, and Career and Noncredit), chaired various ststewide committeed including accreditation and curriculum, and was the faculty lead for ASCCC on the implementation of AB 705 (Irwin, 2017).
Are adequate numbers of qualified faculty, staff, and administrators available to teach and/or implement all components within a program/service area's offerings or services?
Due to reassign time for Professors Rutan, the program has been forced to hire several adjunct faculty to cover course offerings. We have been able to find enough people to cover the course offerings but we have had to interview new instructors every semester. We have had difficulty finding qualified instructors for the Physics 250 sequence, but we believe that our latest hire will be very effective in that role. Finding qualified instructors that are effective in the classroom is challenging for physics and hiring additional full time faculty might be needed if the program continues to expand.

There is not sufficient staffing to support the laboratory instrction for the program. The program needs permanent laboratory support in order to properly train the individual, shift the responsibility for orderiing supplies from Professor Rutan, and to properly maintain all of the laboratory equipment used by the program.

Are adequate and appropriate mentoring and professional development opportunities available and do department faculty, staff, and administrators regularly utilize these opportunities?
The full time faculty participate in many faculty development activities throughout the year. While there are an adequate number of offerings, it would be nice to have more offerings that part time faculty could attend. Many adjunct faculty are unable to attend sessions during the day but that is when many of the best activities are.

To what extent are adjunct faculty, part-time staff, and interim administrators knowledgeable about the program/service area's practices and standards? What opportunities are provided for adjunct faculty, part-time staff, and interim administrators to become engaged in program/service area activities and communication?
The adjunct faculty members are included in the department meeting at the beginning of each semester and are included in any communication about the courses we offer. We share course content that we have developed with new instructors, and we share classroom practices that we find effective. We also meet with new instructors on a regular basis to go over how to use lab equipment. We believe that our adjunct faculty are an essential part of our program and we strive to show them that level of respect.

Upon consideration of the information you have presented in this section, what areas or issues will need attention from the program/service area in the next three years?
The program continues to need a permanent laboratory assistant and the restoration of supplemental instruction to return the expansion that was anticipated a few years ago.

Internal and External Communication

Program Review Internal & External Communication : Version by **Rutan, Craig** on **11/22/2019 02:18**

When were the program/service area's catalog entries last updated to ensure currency and accuracy?
The catalog entries for the program are reviewed eah year and were last reviewed in spring 2019.
When was the program/service area's Annual Plan (formerly called DPP) last updated to ensure currency and accuracy?
The programs annual plan was last updated in September 2019 and is reviewed twice each year. It will be reviewed again in spring 2020.
How does the program/service area keep its website comprehensive and current? Does the website contain the program/service area's mission? Does the website contain current contact information (telephone numbers, email addresses, and office hours and locations) for program/service area faculty and/or staff? Are program/service area outcomes posted? Are outcome assessment results posted?
Professor Rutan is responsible for updating the program's website, but the website needs to be updated to reflect the current course offerings. The contact information for the full time faculty is posted to the website, but the site needs to be updated with the contact information for the part time faculty. Outcomes assessment results haven't been posted to the program's website, but they could be posted in the future if that is where the college would like them stored.
How does the program/service area keep instructional faculty, counselors, advisors, and/or service area personnel informed about course offerings, trainings, workshops, and related practices?
The full time faculty meet with the counseling faculty to discuss the sequencing of courses and who should be taking them. Professor Swift also works directly with the STEM counselor that interacts with many of the students taking the Physics 150 and 250 sequences. Despite these efforts, many of the students are choosing to not meet with a counselor and many biology majors are enrolling in the incorrect physics sequence for their major.
How well do faculty and staff communicate about and coordinate the work of the program/service area?
The faculty try to work with other programs to schedule classes in a way that maximizes opportunities for students. This includes coordination with Mathematics, Biology, and Chemistry. Our primary concern is to schedule courses that do not conflict with the mathematics courses our students may be enrolled in. It has become increasingly difficult to schedule courses that do not conflict with organic chemistry and this could impact enrollment in the Physics 150 sequence in the future.
Upon consideration of the information you have presented in this section, what areas or issues will need attention from the program/service area in the next three years?
The webiste needs to be updated more frequently to accurately communicate information about the program and its success to students and the community at large.

Planning Agenda

Program Review Planning Agenda : Version by **Rutan, Craig** on **11/22/2019 02:18**

Actions for 2019-2022	Supporting Data	Resources Needed	Estimated Cost
Hire a ongoing instructional assistant to support the laboratory activities of the program.	The physics program supports more different laboratory courses than any other program that receives no classified support.	1 ongoing instructional assistant	~26,000/year
Restore supplemental instruction to other mathematical physics courses	Supplemental instruction has improved student success in every course that it has been offered (including Physics 250A and Physics 250B). We have every reason to believe that it will improve student success when added to these additional courses.	SI Leaders	~15,000/year

Actions for 2019-2022	Supporting Data	Resources Needed	Estimated Cost
Dedicated funding to ensure that engineering courses are not canceled for low enrollment until the program has been offered fully for multiple years.	The initial engineering offerings have had enrollment well under 20 students per section and the offering in fall 2019 was canceled due to low enrollment.	LHE that is not dependent on enrollment to allow the program to establish the course offerings to students and build enrollment.	~4000/semester

Summary Report

Program Review Summary Report - What is and is not working : Version by **Rutan, Craig** on **11/22/2019 02:18**

Briefly describe and explain what is working well in your program/service area.
The physics, physical sciences, and engineering program continues to effectively meet the transfer needs of students for general education, the physical sciences requirement for future elementary school teachers, the trasfer needs of biological sciences and pre-medicine majors, and the major preparation requirements of students planning to major in the physical sciences, computer science, and engineering disciplines.
Briefly describe and explain what is not working well or needs attention in your program/service area.
The program has not effectively established the major preparation engineering courses that have been developed to meet the needs of students. The faculty need to update the course outlines two address articulation issues for some of the courses and need to find a consistent course schedule that students can rely on that will allow the courses to build reliable enrollement.

Program Review Summary Report - Resources : Version by **Rutan, Craig** on **11/22/2019 02:18**

Facilities	Technology	Equipment	Personnel
			Laboratory Assistant to support the laboratory experiments, maintain laboratory equipment, assist with the development of new experiments, and to order the supplies and equipment for the program.
			Supplemental Instruction (SI) leaders for physics courses to restore the service that was lost to our students and appears to be impacting the success rates of some student groups.

Program Review Summary Report - Initiatives and Other Findings : Version by **Rutan, Craig** on **11/22/2019 02:18**

What campus-wide initiatives intersect with your program's activities, operations and/or plans? (Please provide a hyperlink and a list of initiatives)
The program's work clearly intersects with the college's guided pathways efforts. The program currently offers two courses that may meet the general education needs of students and offers course sequences that specifically support STEM majors and future elementary school teachers.
Summarize any other findings from your program/service area review and planning process that you would like to share with the college community.
The physics, physical sciences, and engieering program continues to effectively meet the major preparation and general education needs of students. The program needs to rework the engineering courses to ensure that they meet the needs of students tranferring to any four year university. Without classified and instructional support, it is unclear if the program will be able to effectively support the needs of the campus community.