Comprehensive Program Review Report

Program Review - Physics

Program Summary

2020-2021

Prepared by: Larry Owens

What are the strengths of your area?: The Physics Department offers two physics course sequences to meet the needs of various science and mathematics-based majors. The calculus-based sequence (PHYS 55, 56, 57) is designed for engineering, physics, mathematics and other majors requiring the more advanced level of physics. The algebra/trigonometry-based sequence (PHYS 20, 21) typically meets the needs of biology, health science, and computer science majors, among others.

In spring 2016, the physics department began to offer another "scheduling track" for the calculus-based physics sequence which allows more options for student success in physics. Traditionally, the calculus-based, three-course sequence has been offered starting in the spring (Phys 55-spring, Phys 56-fall, Phys 57-spring). To support students who don't follow the traditional schedule, as well as to provide students a more immediate option to re-take a course (rather than waiting a full year), an alternative course sequence schedule has been developed and is now fully implemented. The alternative track and variety in delivery method supports student success.

For more information on enrollments and success rates, see the attached Excel spreadsheet file "PHYS Enrollments and Success by AY Sep20.xlsx".

The physics laboratory is fairly-well equipped and new equipment has been acquired through Above-Base and grant funding. These funds have been used to purchase enough equipment for more lab groups to be able to operate at the same time within each lab section. The physics labs are taught in John Muir 208, which has 8 lab tables. The goal is to have 8 complete setups of each experiment to support full classes and engagement by all students. By having enough equipment, the lab can accommodate more students while providing a meaningful hands-on experience for each student. The funds are also used to upgrade the equipment so students can work with modern data acquisition in addition to traditional methods. A mixture of both provides a well-rounded laboratory experience for the student.

What improvements are needed?: 1. Support increased student enrollments, success, transfer and degree completion in physics.

To support student needs in physics and related courses (Astronomy, Natural Science (designed for education majors) & Physical Science (general education lab science course)), the physics department needs at least two full-time faculty and one or two adjunct faculty. This is in addition to a full-time faculty member in the engineering department. Without adding any additional courses beyond what is already scheduled, there is sufficient teaching load to support two full-time physics faculty and still have overload and need for adjunct faculty. In academic year 2019-20, we had a 1-year, full-time temporary faculty member. In spring 2020, we hired a full-time, tenure-track faculty member in physics (Dr. Quinn MacPherson), who began teaching in August 2020. Having two full-time physics faculty allows us to continue offering the expanded course offerings in the two majors physics sequences (20/21 and 55/56/57) that has increased enrollments and facilitated improved student scheduling and degree completion. The physics sequences are needed for ASTs in biology, mathematics, chemistry, computer science, engineering, and physics. Expanded course offerings in physics have also had a positive impact on the enrollment in advanced engineering courses.

Our senior faculty member in physics, who was hired in 1989, is retiring at the end of this academic year. Hiring a replacement for that faculty member will be critical to hold on to the progress made in meeting student needs and expanding our programs in physics and engineering. We are requesting a replacement position to support students by continuing to cover expanded course

offerings.

2. Increase student engagement in the physics laboratory

Over the last several years, we have been able to use a variety of funding sources to purchase equipment for the physics laboratory. Purchases typically fall within two areas to improve the student experience in the lab and to prepare them for future courses and transfer. The first type of purchase is to modernize the equipment for an experiment that we have already been using; i.e. upgrading 1950's or 1960's equipment with modern digital equipment or just properly-operating, non-worn equipment. The second type of purchase is to add to the experimental repertoire that we can use in the student labs. Within this second type of purchase, we would be looking to add equipment that can quantitatively measure electric charges and electric fields for PHYS 56 and PHYS 21. Additional equipment could also be used in the area of thermal physics, where some new experiments with modern sensors would be useful. Most of our modern equipment that involves electronic sensors and automated data acquisition makes use of equipment from either Vernier Software & Technology or PASCO Scientific. By standardizing on these two platforms, we can add additional sensors and experiments at a lower cost and without having to invest as much time in learning how to use the equipment. We have also been trying to provided a minimum of eight laboratory sets of equipment when we make purchases, so we can have eight lab groups working simultaneously. This works out to 2 to 4 students per lab group, which increases student engagement and participation - nobody gets to stand around and watch the other group members work. A new action this year is a request for data acquisition units that are needed to interface equipment that was purchased several years ago but was never used for lack of these interfaces. Our new faculty member has identified an inexpensive solution from PASCO to get this equipment working and in the hands of the students in PHYS 55 and PHYS 57.

3. On-going support for student success in physics laboratory activities

We need an augmentation to our annual supply budget. We have added several new sections of courses without any increase in the budget to support them over the last several years. The physical science budget is used to support courses in physics, geology, geography, natural science, astronomy, and physical science. While we have been fortunate to be able to make equipment purchases with grant funding and above-base instructional money over the last several years, supplies and smaller pieces of equipment must be purchased using our annual supply budget. We missed the deadline last year due to COVID-19, but we will be submitting the appropriate paperwork to make the augmentation request this year.

4. Support student success in physics through continued and expanded opportunities in physics course scheduling

Success rates in all physics courses for all students improved for 2019-2020 at 79.9% compared to the 2018-2019 rate of 67.0%. The statewide average for physics is about 72%, so the department overall is performing satisfactorily. When ethnicity is factored in, there does not appear to be a clear picture of any one group having greater difficulty than another. For the most recent academic year (2019-2020), the success rate for Hispanics (77.7%) and White (78.9%), are essentially equivalent. The Multi-Ethnic group had the highest success rate of 89.5%. (Success data from Tableau Public). Hispanics represent the majority of our enrollment at 145 students, followed by White at 57, and Multi-Ethnic at 19. It is hoped that an increase in the overall success rate will improve the success rate for all ethnic groups.

Having parallel, but offset scheduling tracks for the calculus-based physics sequence has been extremely successful. (See the attached Excel spreadsheet file "PHYS Enrollments and Success by AY Sep20.xlsx".)

We have completed the offset track sequence in PHYS 55/56/57 by offering PHYS 57 for the first time in the fall semester 2020. We are also expanding the offerings in the algebra-trig-based physics by offering a nontraditional section of PHYS 20 in spring 2020 and spring 2021. Continuing this spring offering and adding a single section of PHYS 21 in the fall semester would allow a student to take PHYS 20 or 21 in either semester. Having these offset tracks for our main physics sequences allows students to start the sequence in any semester, retake a failed course immediately in the following semester, and to complete the sequence in a minimum number of semesters. We have requested the addition of a section of PHYS 21 to the fall 2021 schedule.
Describe any external opportunities or challenges.: Due to flexibility that the statewide physics FDRG built into the physics C-ID descriptors, our COS students sometimes have trouble on transfer due to course articulation issues. The C-ID descriptors for physics include "floating topics" which causes colleges and universities to have different placement of certain topics in their course sequences. We have aligned our course topics with CSU Fresno's courses, but it does cause issues for students transferring to other universities. Work at the state level would be required to align courses so they contain the same topics. This was the goal of the C-ID descriptors, but was not carried out successfully by the physics group.

Physics Department faculty are interested in participating in externally-funded grants to provide research opportunities for our students.
Overall SLO Achievement: All course level assessments are up to date. Students assessments indicate that students are generally performing as expected, but there is always room for improvement.
Changes Based on SLO Achievement: No additional changes based on SLOs are planned at this time.
Overall PLO Achievement: Program level outcomes have been mapped and an assessment plan has been developed. Next step is to assess the PLOs using the developed assessment criteria.
Changes Based on PLO Achievement: No changes based on program outcomes at this time.
Outcome cycle evaluation: The physics program is meeting the assessment cycle requirements. The cycle appears well designed to regularly assess the physics courses.

Action: (2020-2021) Maintain increased student enrollments, success, transfer and degree completion in physics. (Replacement Faculty Member)

Hire a full-time, tenure-track professor in physics to replace a retiring faculty member.

Leave Blank:
Implementation Timeline: 2020 - 2021
Leave Blank:
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Identify related course/program outcomes: By continuing to have two full-time faculty members, students get exposed to a different viewpoint and new ways of approaching physics. That helps to achieve the following Program Outcomes:
1. Physics Problems: Students will develop the ability to identify, formulate, and solve physics problems.
2. Experiment Design: Students will develop the ability to design and conduct experiments, as well as to analyze and interpret experimental data.
3. Critical Thinking: Students will develop the ability to use critical thinking in problem solving.

By having two full-time faculty members, we can offer expanded opportunities in student scheduling of physics courses. We have already shown that by adding a parallel, but offset track in the calculus based physics sequence, our enrollments in those courses essentially doubled. The numbers of successful students in those courses as also seen dramatic increases. Enrollments are up, success is up, and students can minimize their time to degree and/or transfer. That helps to achieve the following District Objectives:
District Objective 1.1 The District will increase FTES by 1.75% over the three years
District Objective 2.1 Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years
District Objective 2.2 Increase the number of students who transfer to a four-year institution by 10 percent over three years
Person(s) Responsible (Name and Position): Francisco Banuelos (Dean), Ryan Froese (Division Chair), Larry Owens (Faculty)
Rationale (With supporting data): To support student needs in physics and related courses (astronomy, natural science, and physical science), the physics department needs at least two full-time faculty. Current course offerings provide load (plus overload) for two full-time physics faculty, plus courses for one or more adjunct faculty. Having two full-time physics faculty allows us to continue offering the expanded course offerings in the two majors physics sequences (20/21 and 55/56/57) that has increased enrollments and facilitated improved student scheduling and degree completion. The physics sequences are needed for ASTs in biology, mathematics, chemistry, computer science, engineering, and physics.

The CCC Chancellor's Office is working with the University of California system in developing a UC Guaranteed Transfer Pathway for Physics. The draft template closely matches our current offerings, so this may become an attractive incentive for increasing numbers of transfer students. This will likely increase demand for our courses and the physics major.

The position being requested is for replacement for a faculty member who has indicated they will be retiring at the end of the spring 2021 semester. That faculty member was hired in 1989 as a replacement for a retirement at that time. We are requesting the replacement position to support students by continuing to cover physics program offerings.

Priority: High
Safety Issue: No
External Mandate: No

Program Review - Physics

Safety/Mandate Explanation:

Resources Description

Personnel - Faculty - Replacement full-time, tenure-track faculty member in physics. (Active)

Why is this resource required for this action?: To support student needs in physics and related courses (astronomy, natural science, and physical science), the physics department needs at least two full-time faculty. Current course offerings provide load (plus overload) for two full-time physics faculty, plus courses for one or more adjunct faculty. Having two full-time physics faculty allows us to continue offering the expanded course offerings in the two majors physics sequences (20/21 and 55/56/57) that has increased enrollments and facilitated improved student scheduling and degree completion. The physics sequences are needed for ASTs in biology, mathematics, chemistry, computer science, engineering, and physics.

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Notes (optional):

Cost of Request (Nothing will be funded over the amount listed.): 100000

Link Actions to District Objectives

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

Action: (2020-2021) Enhancing student learning through real time data acquisition and analysis experience.

Purchase 8 PASCO Air Links to be able to interface existing equipment to computers in the physics laboratory.

Leave Blank:

Implementation Timeline: 2020 - 2021

Leave Blank:

Leave Blank:

Identify related course/program outcomes: This equipment supports the laboratory-components in the following courses:
Physics 55
Physics 57

This equipment supports the following program-level outcomes:
1. Physics Problems: Students will develop the ability to identify, formulate, and solve physics problems.
2. Experiment Design: Students will develop the ability to design and conduct experiments, as well as to analyze and interpret experimental data.
3. Critical Thinking: Students will develop the ability to use critical thinking in problem solving.

By using up-to-date equipment and making the labs more relevant and interesting, student enrollment, success and transfer will be positively impacted. These effects would support the following District Objectives:
District Objective 1.1 The District will increase FTES by 1.75% over the three years.
District Objective 2.1 Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5

percentage points over three years.
District Objective 2.2 Increase the number of students who transfer to a four-year institution by 10 percent over three years.
Person(s) Responsible (Name and Position): Quinn MacPherson (Physics Faculty), Larry Owens (Physics Faculty)
Rationale (With supporting data): We currently have a set of 8 multi-use PASCO rotary motion sensors as well as a set of eight PASCO PASport light sensors that can be used to take real time data for multiple labs for the PHYS 055 and PHYS 057 courses. However, these existing sensors need to be connected to computers (such as the laboratory laptops that we already have) so that the data can be recorded. Recording the data allows students to plot the results of their experiments in real time as well as export the data in an Excel file so that the students can further analyze the data. The PASCO air-links connect the sensors to the computers. We currently have a single PASCO Universal Interface which allows up to 4 four sensors to be connected to a single computer. This existing interface works for teacher demos but – because there is only one interface – is not amenable to allowing each student (or each lab group once COVID is over) to take their own data. As we have 8 lab benches, we are requesting a total of 8 PASCO Air links. Note that many of the labs for PHYS 57 require both the rotary motion sensor and light sensor in tandem, so two PASCO airlinks are needed for each computer. However, there are currently only 4 of these setups (less the two airlinks needed to connect the two sensors) so a total of 8 airlinks are needed to record data from them. At a total of $600 (including tax and shipping), this option is considerably cheaper than purchasing 4 universal interfaces which are $499 apiece. As electronic equipment, these airlinks are expected to continue working with our existing equipment and other sensors that we may acquire for many years to come.
Priority: High
Safety Issue: No
External Mandate: No
Safety/Mandate Explanation:

Resources Description

Equipment - Instructional - Purchase 8 PASCO Air Links to make use of equipment we already have. Without a these computer interfaces, existing equipment is going unused. (Active)

Why is this resource required for this action?: We currently have a set of 8 multi-use PASCO rotary motion sensors as well as a set of eight PASCO PASport light sensors that can be used to take real time data for multiple labs for the PHYS 055 and PHYS 057 courses. However, these existing sensors need to be connected to computers (such as the laboratory laptops that we already have) so that the data can be recorded. Recording the data allows students to plot the results of their experiments in real time as well as export the data in an Excel file so that the students can further analyze the data. The PASCO air-links connect the sensors to the computers. We currently have a single PASCO Universal Interface which allows up to 4 four sensors to be connected to a single computer. This existing interface works for teacher demos but – because there is only one interface – is not amenable to allowing each student (or each lab group once COVID is over) to take their own data. As we have 8 lab benches, we are requesting a total of 8 PASCO Air links. Note that many of the labs for PHYS 57 require both the rotary motion sensor and light sensor in tandem, so two PASCO airlinks are needed for each computer. However, there are currently only 4 of these setups (less the two airlinks needed to connect the two sensors) so a total of 8 airlinks are needed to record data from them. At a total of $600 (including tax and shipping), this option is considerably cheaper than purchasing 4 universal interfaces which are $499 apiece. As electronic equipment, these airlinks are expected to continue working with our existing equipment and other sensors that we may acquire for many years to come.
Notes (optional):
Cost of Request (Nothing will be funded over the amount listed.): 600
Related Documents:
PASCO AirLink Description and Price Quote.pdf

Link Actions to District Objectives

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

Program Review - Physics

Action: (Continued 2019-20) Increase student engagement in the physics laboratory

Purchase 8 laboratory sets of a Vernier charge sensor and electrostatics kit to give quantitative measurements of electric charge. These will be used to accommodate 8 lab groups in PHYS 21 and PHYS 56 where the topics of electric charge and electric fields are covered.

Leave Blank:
Implementation Timeline: 2019 - 2020
Leave Blank:
Leave Blank:
Identify related course/program outcomes: This equipment supports the laboratory-components in the following courses:
Physics 21
Physics 56

This equipment supports the following program-level outcomes:
1. Physics Problems: Students will develop the ability to identify, formulate, and solve physics problems.
2. Experiment Design: Students will develop the ability to design and conduct experiments, as well as to analyze and interpret experimental data.
3. Critical Thinking: Students will develop the ability to use critical thinking in problem solving.

By using up-to-date equipment and making the labs more relevant and interesting, student enrollment, success and transfer will be positively impacted. These effects would support the following District Objectives:
District Objective 1.1 The District will increase FTES by 1.75% over the three years.
District Objective 2.1 Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years.
District Objective 2.2 Increase the number of students who transfer to a four-year institution by 10 percent over three years.
Person(s) Responsible (Name and Position): Larry Owens, Physics Professor
Rationale (With supporting data): The PHYS 56 and PHYS 21 courses include the topics of electric charge and electric fields. Currently, we conduct qualitative experiments in electrostatics to demonstrate charge transfer by conduction, induction and polarization. We also demonstrate electric fields by drawing equipotential lines on conductive paper, which can then be used to draw in the electric field lines. It would be desirable to expand these qualitative experiments into more quantitative experiments by making actual measurements of the amount of charge and being able to indirectly calculate the electric field strength from those measurements.

Vernier Software & Technology sells a charge sensor and electrostatics kit that would fit this requirement. We already have the Vernier interfaces and software that will work with the charge sensor, so we do not have to purchase those. By standardizing on one manufacturer's interface whenever possible, we can reduce costs when adding new capabilities and the learning curve for implementing new experiments is reduced for both the instructor and the students.

Priority: High
Safety Issue: No
External Mandate: No
Safety/Mandate Explanation:

Update on Action

Updates

Update Year: 2020 - 2021 10/14/2020
Status: Continue Action Next Year
Proposal for the charge sensors and electrostatics kits was submitted to the above-base process, but was not ranked high enough for funding in the previous year. We will resubmit for consideration again this year.
Impact on District Objectives/Unit Outcomes (Not Required):

Program Review - Physics

Resources Description

Equipment - Instructional - The Vernier charge sensor and electrostatics kit provide the necessary equipment to conduct quantitative experiments in the measurement of electric charge. The equipment can be used in a variety of configurations to investigate several different phenomena. The physics department already has the necessary interfaces and software to operate the sensor, which reduces the cost of implementation. (Active)

Why is this resource required for this action?: The PHYS 56 and PHYS 21 courses include the topics of electric charge and electric fields. Currently, we conduct qualitative experiments in electrostatics to demonstrate charge transfer by conduction, induction and polarization. We also demonstrate electric fields by drawing equipotential lines on conductive paper, which can then be used to draw in the electric field lines. It would be desirable to expand these qualitative experiments into more quantitative experiments by making actual measurements of the amount of charge and being able to indirectly calculate the electric field strength from those measurements.

Vernier Software & Technology sells a charge sensor and electrostatics kit that would fit this requirement. We already have the Vernier interfaces and software that will work with the charge sensor, so we do not have to purchase those. By standardizing on one manufacturer's interface whenever possible, we can reduce costs when adding new capabilities and the learning curve for implementing new experiments is reduced for both the instructor and the students.

This equipment supports the following program-level outcomes:
1. Physics Problems: Students will develop the ability to identify, formulate, and solve physics problems.
2. Experiment Design: Students will develop the ability to design and conduct experiments, as well as to analyze and interpret experimental data.
3. Critical Thinking: Students will develop the ability to use critical thinking in problem solving.

By using up-to-date equipment and making the labs more relevant and interesting, student enrollment, success and transfer will be positively impacted. These effects would support the following District Objectives:
District Objective 1.1 The District will increase FTES by 1.75% over the three years.
District Objective 2.1 Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years.
District Objective 2.2 Increase the number of students who transfer to a four-year institution by 10 percent over three years.

Notes (optional):
Cost of Request (Nothing will be funded over the amount listed.): 1900
Related Documents:
Vernier Quote for Charge Sensors & Electrostatics Kits 27Sep19.pdf

Link Actions to District Objectives

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

Action: (Completed Fall 2020) Support increased student enrollments, success, transfer and degree completion in physics

Hire one full-time, tenure-track faculty member to teach physics, astronomy, natural science and physical science.

Leave Blank:
Implementation Timeline: 2019 - 2020

Program Review - Physics

Leave Blank:
Leave Blank:
Identify related course/program outcomes: By having an additional full-time faculty member, students get exposed to a different viewpoint and new ways of approaching physics. That helps to achieve the following Program Outcomes:
1. Physics Problems: Students will develop the ability to identify, formulate, and solve physics problems.
2. Experiment Design: Students will develop the ability to design and conduct experiments, as well as to analyze and interpret experimental data.
3. Critical Thinking: Students will develop the ability to use critical thinking in problem solving.

By having an additional full-time faculty member, we can offer expanded opportunities in student scheduling of physics courses. We have already shown that by adding a parallel, but offset track in the calculus based physics sequence, our enrollments in those courses essentially doubled. The numbers of successful students in those courses as also seen dramatic increases. Enrollments are up, success is up, and students can minimize their time to degree and/or transfer. That helps to achieve the following District Objectives:
District Objective 1.1 The District will increase FTES by 1.75% over the three years
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District Objective 2.2 Increase the number of students who transfer to a four-year institution by 10 percent over three years
Person(s) Responsible (Name and Position): Larry Owens, Physics Professor; Francisco Banuelos, Dean; Thea Trimble, Division Chair
Rationale (With supporting data): To support student needs in physics and related courses (Astronomy, Natural Science (designed for education majors) & Physical Science (general education lab science course)), the physics department needs at least two full-time faculty and one or two adjunct faculty. This is in addition to a full-time faculty member in the engineering department. Without adding any additional courses beyond what is already scheduled, there is sufficient teaching load to support two full-time physics faculty. In spring 2020, because of the hiring of a 1-year full-time temporary faculty member for the 2019-20 academic year, we will have that situation (2 full-time and 1 adjunct teaching physics, astronomy, natural science and physical science). Having two full-time physics faculty allows us to continue offering the expanded course offerings in the two majors physics sequences (20/21 and 55/56/57) that has increased enrollments and facilitated improved student scheduling and degree completion. The physics sequences are needed for ASTs in biology, mathematics, chemistry, computer science, engineering, and physics. Expanded course offerings in physics have also had a positive impact on the enrollment in advanced engineering courses.

The following are example schedules only - provided to show that there are more than enough courses to support two full-time physics faculty and 1 full-time engineering faculty. Normal college, division and department scheduling and class selection processes must be followed to adhere to the appropriate contract provisions. Schedules such as these support scheduling to facilitate student success and shorter times to degree completion.

FALL Semester
Engineering Faculty: ENGR 1, ENGR 2, ENGR 110, PTA 131, ENGR 20, ENGR Surveying
Physics Faculty #1: PHYS 20 (2 labs), PHYS 55 (2 labs), PHYS 57
Physics Faculty #2: PHYS 56 ,NSCI 131, ASTR 10, PHYS 21

SPRING Semester
Engineering Faculty: ENGR 3, ENGR 4, ENGR 20, ENGR 1, ENGR 110
Physics Faculty #1: PHYS 56, PHYS 21, NSCI 131
Physics Faculty #2: PHYS 55 (2 labs), PHYS 57, ASTR 10, PHYS 20

The Physics Department has not had a new full-time position for several decades. The current full-time physics faculty member was hired in 1989 as a replacement for a retirement. In 2000, the current engineering faculty member was hired as a replacement for a retirement with a load split between ENGR and PHYS. We are requesting a new position to support students by continuing to cover expanded course offerings.

Priority: High
Safety Issue: No
External Mandate: No

Program Review - Physics

Safety/Mandate Explanation:

Update on Action

Updates

Update Year: 2020 - 2021 10/01/2020
Status: Action Completed
Dr. Quinn MacPherson was hired and began teaching in Fall 2020.
Impact on District Objectives/Unit Outcomes (Not Required):

Resources Description

Personnel - Faculty - New full-time tenure-track faculty member in physics. (Active)
Why is this resource required for this action?: To support student needs in physics and related courses (astronomy, natural science, and physical science), the physics department needs at least two full-time faculty. Current course offerings provide load for two full-time physics faculty, plus one or more adjuncts. Having two full-time physics faculty allows us to continue offering the expanded course offerings in the two majors physics sequences (20/21 and 55/56/57) that has increased enrollments and facilitated improved student scheduling and degree completion. The physics sequences are needed for ASTs in biology, mathematics, chemistry, computer science, engineering, and physics.

The CCC Chancellor's Office is working with the University of California system in developing a UC Guaranteed Transfer Pathway for Physics. The draft template closely matches our current offerings, so this may become an attractive incentive for increasing numbers of transfer students. This will likely increase demand for our courses and the physics major.

The Physics Department has not had a new full-time position for several decades. The current full-time physics faculty member was hired in 1989 as a replacement for a retirement. In 2000, the current engineering faculty member was hired as a replacement for a retirement with a load split between ENGR and PHYS. We are requesting a new position to support students by continuing to cover expanded course offerings.
Notes (optional):
Cost of Request (Nothing will be funded over the amount listed.): 80000

Link Actions to District Objectives

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.1 - Increase the percentage of students who earn an associate degree or certificate (CTE and Non-CTE) by 5 percentage points over three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

Action: (Continued 2018-19) Support student success in physics through continued and expanded opportunities in physics course scheduling

By continuing to offer two different scheduling tracks, class formats (hybrid & traditional) and teaching approaches, students will continue to have expanded opportunities to successfully complete the full calculus-based physics sequence. Enrollment has increased in the non-calculus based physics (PHYS 20 and 21) so it now is logical to add a section of each every semester.

Leave Blank: New Action
Implementation Timeline: 2019 - 2020
Leave Blank:
Leave Blank:
Identify related course/program outcomes: Because this would increase enrollment and success in Phys 55, 56 and 57 it affects

all course outcomes for these three courses.
Person(s) Responsible (Name and Position): Jennifer Vega La Serna (VP Academic Services), Robert Urtecho (dean), Julie Rodriguez (Science Division Chair), Larry Owens (faculty), Shirin Sadeh (faculty)
Rationale (With supporting data): Success rates for Phys 55 in Spring 2015 support the continued offering of two different formats and different teaching approaches. According to the 2016 Program Review Data Metric the success rate for Phys 55 was 53% in Spring 15, see also S15-Phys55 in documents. Staggered scheduling, for example offering Phys 55 in the spring and also in the fall, allows students who fail or withdraw from the course the fall semester to take the course the following spring (or, if they fail in the spring they can take it the following fall). Offering two staggered scheduling tracks and alternative approaches has resulted in a net increase in student enrollments. With an increased number of students enrolled in these physics courses there will be an increase in the number of students who complete the courses. This should increase the number of students who complete degrees and/or transfer, as well as increase the number of students qualified to take courses which have these physics courses as pre-requistes (e.g. ENGR 2, 3 and 4).
Priority: High
Safety Issue: No
External Mandate: No
Safety/Mandate Explanation:

Update on Action

Updates

Update Year: 2020 - 2021 10/14/2020
Status: Continue Action Next Year
Now that we are teaching the three-semester, calculus-based physics sequence (PHYS 55, 56, 57) on two offset tracks (Fall-Spring-Fall and Spring-Fall-Spring), each class of the sequence is taught with at least one section every semester. A student can begin the sequence at any point and if they do not pass a course, they can retake it the next semester. This has helped to greatly increase the enrollments and success in the calculus-based physics sequence.
We will continue working to developing similar tracks for the two-semester, non-majors physics sequence (PHYS 20, 21). Traditionally, we have offered it as a Fall-Spring sequence, but we have now added a PHYS 20 in the spring. The addition of PHYS 21 in the Fall 2021 schedule has been proposed.
As we develop the physics sequences to give students more opportunities to complete physics, enrollments are increasing. We currently have two full-time physics professors. With the retirement of one of the senior faculty member, it will be critical to get a replacement to continue offering these courses.

Impact on District Objectives/Unit Outcomes (Not Required):

Resources Description

Personnel - Faculty - Full-time physics instructor (Active)
Why is this resource required for this action?: There is demand for more physics courses than can be offered due to a lack of faculty. We had an adjunct physics faculty last year, but he left to take a full-time position. Just as this fall 2018 semester began, we were able to find an adjunct physics faculty member for this semester, but we had to change the time the course met. Obviously, this affected the students already enrolled in the course, but without this change there would have been no PHYS 20 taught this fall.

In addition to covering our currently offered PHYS 20/21 courses, this full-time position would allow us to teach a section of PHYS 20 in the spring and a section of PHYS 21 in the fall which will allow for a student to begin the sequence in either semester. Enrollment indicates that adding these additional sections would meet a currently unmet demand. Also, with the addition of PHYS 57 in the fall semester to complete the full PHYS 55, 56 & 57 calculus-based physics sequence on two offset tracks (PHYS 55/56/57 Traditional Track: Spring (55), Fall (56), Spring (57) ; Non-Traditional Track: Fall (55), Spring (56), Fall (57)), there is need for another full-time physics professor. In addition to physics, this position could also cover NSCI 131 which is currently being covered by an adjunct who is close to retiring. A single section of NSCI 131 is offered each fall and each spring and the classes are enrolled above the cap.

Physics has not had a new full-time position since 2000 (split between ENGR and PHYS).

Program Review - Physics

It should be noted that the addition of this new full-time physics faculty member will not affect any current faculty member's load or over-load. The need is in addition to what the current faculty can cover. With the current faculty and one new faculty member, there is still more than 3 full-time loads spread over PHYS, ENGR, PSCI, ASTR, MATH, and NSCI.

Notes (optional): By increasing the number of sections of physics offered, other majors will benefit. For example, when a partial Non-Traditional track of calculus-based physics was offered (PHYS 55 & 56) the enrollment in ENGR 2, 3 and 4 courses increased.

Cost of Request (Nothing will be funded over the amount listed.):

Related Documents:

PHYS Enrollments and Success by AY as of Sep19.xlsx

Link Actions to District Objectives

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

District Objectives: 2015-2018
District Objectives - 1.1 - Increase overall enrollment by 1.75% annually
District Objectives - 2.1 - Increase the number of students who are transfer-prepared annually.
District Objectives - 2.2 - Increase the number of students who earn an associate degree or certificate annually.
District Objectives - 3.1 - Reduce the achievement gap of disproportionately impacted student groups annually, as identified in the Student Equity Plan.

Action: (Continued 2018-19) On-going support for student success in physics laboratory activities.

Augment the physical sciences annual supply budget to provide on-going support to purchase consumable supplies used during laboratory exercises (for example, conductive paper & ink, fuses & circuit components).

Leave Blank: New Action
Implementation Timeline: 2019 - 2020
Leave Blank: 01/16/2017
Leave Blank:
Identify related course/program outcomes: Almost all physics course level outcomes have laboratory exercises to support them. Specifically:
Phys 20:
-Projectile Motion
-Conservation of Energy
-Bernoulli's Lab
Phys 21
-Charged particle in a magnetic field
-Electric Fields
-Electric Circuits
Phys 55:
-Newton's Second Law
-Conservation of Energy
Phys 56:
-Kirchoff's Rules
-Ampere's Law

Program Review - Physics

Phys 57:
-Geometric optics
-Blackbody Radiation

Physics program level outcomes supported by an augmented budget:
Experiment Design: Students will develop the ability to design and conduct experiments, as well as to analyze and interpret experimental data.
Person(s) Responsible (Name and Position): Larry Owens, Physics Professor; Thea Trimble (division chair); Francisco Bañuelos (Dean)
Rationale (With supporting data): As the number of sections of physics increases the need to support the laboratory experiences also increases. Major equipment purchases must be made with outside grant funding or above-base equipment funding, but the annual supply budget needs to be used for smaller pieces of equipment and consumable supplies. The physical science budget is used not only for physics, but geology, natural science, earth science, geography, astronomy, and physical science. The budget has not increased in several years.
Priority: High
Safety Issue: No
External Mandate: No
Safety/Mandate Explanation:

Update on Action

Updates

Update Year: 2020 - 2021 10/14/2020
Status: Continue Action Next Year
Due to COVID-19 issues in spring 2020, the request for additional budget augmentation was not submitted. We will submit the request this coming spring per the district procedures.
Impact on District Objectives/Unit Outcomes (Not Required):

Resources Description

Instructional equipment - On-going annual support to provide consumable supplies to support physics laboratory exercises (for example, conductive paper & ink, fuses & circuit components). (Active)
Why is this resource required for this action?: Students use these items during normal laboratory activities and they need to be replaced so the next semester's students can have the same laboratory experiences.
Notes (optional):
Cost of Request (Nothing will be funded over the amount listed.): 300

Link Actions to District Objectives

District Objectives: 2018-2021
District Objective 1.1 - The District will increase FTES by 1.75% over the three years
District Objective 2.2 - Increase the number of students who transfer to a four-year institution by 10 percent over three years

District Objectives: 2015-2018
District Objectives - 2.1 - Increase the number of students who are transfer-prepared annually.
District Objectives - 2.2 - Increase the number of students who earn an associate degree or certificate annually.
District Objectives - 3.1 - Reduce the achievement gap of disproportionately impacted student groups annually, as identified in the Student Equity Plan.