Physics and Astronomy

Summary of Program Review:

A. Major Findings

1. Strengths:

Physics and Astronomy has rates of retention and successful course completion that exceed the institutional rate for all students and for all identified equity groups. We have a student-centered approach which recently has included making our sections Zero Textbook Cost and introducing hybrid and hyflex classes to meet student need/preference. We work closely with the MESA program, utilize supplemental instruction when possible, and promote campus services.

2. Areas for Improvement:

We will continually monitor and respond to student enrollment/demand.

3. Projected Program Growth, Stability, or Viability:

Stability

B. Program's Support of Institutional Mission and Goals

1. Description of Alignment between Program and Institutional Mission:

The Physics and Astronomy program prepares students for roles in STEM. We offer physics for scientists that would prepare a student to become an engineer, physicist, or astronomer. We offer physics for pre-health that is part of the academic path to careers such as medical doctor, optometrist, physical therapist, ultrasound technician, veterinarian, and more. Our GE level courses support transfer and local AS degrees such as Machine Tool Technology.

2. Assessment of Program's Recent Contributions to Institutional Mission:

We have kept students at the core of our mission, particularly in the wake of the COVID pandemic. Since our last program review, we have made all our sections zero textbook cost. We have also created online and hybrid classes, including some hyflex sections which give students choice about attending online or in person.

3. Recent Program Activities Promoting the Goals of the Institutional Strategic Plan and Other Institutional Plans/Initiatives:

We support the strategic plan by working closely with MESA and offering Supplemental Instruction when possible. These activities have yielded higher program rates for retention and successful course completion rates compared to the institutional average for all identified equity groups. We have also adjusted our course offerings to match changes in enrollment.

C. New Objectives/Goals:

We will continue monitoring student demand, search for high quality faculty for our adjunct pool (to replace members recently lost), and continue considering expansion of our pre-health offerings. Possible future offerings include running a new section of Physics 120 in spring semesters and creating a calculus supplement for Physics 120 and 121.

D. Description of Process Used to Ensure "Inclusive Program Review"

Discussed this review with department faculty including adjunct faculty and our Dean.

Program Review Report Fall 2023

This report covers the following program, degrees, certificates, area(s) of study, and courses (based on the Taxonomy of Programs on file with the Office of Academic Affairs):

Program	Physics and Astronomy
Degrees/Certificates	Physics: AS-T
Courses	PHYS-110
	PHYS-111
	PHYS-120
	PHYS-121
	PHYS-140
	PHYS-199*
	PHYS-240
	PHYS-241
	PHYS-250*
	ASTR-110

Taxonomy of Programs, July 2022

* Please note that PHYS-250 has been archived and currently lists as inactive in CourseLeaf. PHYS-199 has not been active but remained on the books, in case we need it.

I. PROGRAM DATA

A. Demand

1. Headcount and Enrollment

	2020-2021	2021-2022	2022-2023	Change over 3-Year Period
Headcount				
Within the Program	**554**	**385**	**362**	**-34.7%**
Across the Institution	**7,193**	**6,653**	**6,155**	**-14.4%**
PHYS-110	149	100	97	-34.9%
PHYS-111	40	19	29	-27.5%
PHYS-120	40	36	37	-7.5%
PHYS-121	15	13	11	-26.7%
PHYS-140	102	59	58	-43.1%
PHYS-199	--	--	--	--
PHYS-240	67	48	49	-26.9%
PHYS-241	49	65	25	-49.0%
PHYS-250	--	--	--	--
ASTR-110	208	119	126	-39.4%
Within the Program	**670**	**459**	**432**	**-35.5%**
Across the Institution	**30,381**	**25,212**	**23,473**	**-22.7%**
Source: SQL Queries for Fall 2023 Program Review				

RPIE Analysis: The number of students enrolled (headcount) in the Physics and Astronomy Program decreased by 34.7% over the past three years, while headcount across the institution decreased by 14.4%. Similarly, enrollment within the Physics and Astronomy Program decreased by 35.5%, while enrollment across the institution decreased by 22.7%.

Enrollment in the following courses changed by more than 10% (± 10%) between 2020-2021 and 2022-2023:

Courses with an enrollment decrease:

- *PHYS-241 (-49.0%)*
- *PHYS-140 (-43.1%)*
- *ASTR-110 (-39.4%)*
- *PHYS-110 (-34.9%)*
- *PHYS-111 (-27.5%)*
- *PHYS-240 (-26.9%)*
- *PHYS-121 (-26.7%)*

Program Reflection:

General education:

ASTR-110: because of declining enrollments, in 2021 we decreased the number of sections offered, yet retained a high fill rate (section size held about steady over 3 years). We can consider adding sections back. We currently run this course online and tried to add an additional in-person section, however, the in-person offering had low enrollment and had to be cancelled. If we had been permitted to run with lower fill rates, we may have retained a higher total head count.

PHYS-110: because of declining enrollments, in 2021 we decreased the number of sections offered and increased the fill rate. However, we have yet to add back more sections. We currently run this course online and tried to add an additional in-person section, however, the in-person offering had low enrollment and had to be cancelled. Running fewer sections has increased the fill rate resulting in 8.5% increase in average section size. If we had been permitted to run with lower fill rates, we may have retained a higher total head count.

Pre-Health track: (PHYS 120/121)
PHYS-120 is the introductory course for pre-health students. The pandemic likely increased the number of students interested in health occupations, so this course has fared better than the college average in terms of head count.
PHYS-121: not every student needs both semesters (120 and 121), so fewer students take 121. With only 11-15 students in the sample, it is not clear if the trend in 121 is a small statistics effect.

Pre-Engineering track: (PHYS 140/240/241, calculus-based physics)
PHYS-140: Of the pre-engineering track, we saw a 43.1% headcount decline in the first semester course (140). My understanding is that students have been failing the math pre-requisites at higher rates and that the physics enrollment links to the calculus success rates. It is known that the pandemic had an impact on the preparation of incoming students, and that is likely the cause of this severe decline.
PHYS-240: This 2nd semester headcount decline, however, was only 26.9%, meaning that we retained students in the track at a higher rate over the course of 3 years. (If we started the sequence with 43.1% fewer students, we would expect this trend to continue for all three semesters, all else being equal).
PHYS-241: Due to low enrollment, in 2022-2023, we had to cut the spring semester 241 course. This caused students to postpone 241 or take it at a different school. Had we not cut this course, I estimate that we would have had at least 10 more students in 2022-2023 and a 28% decline (which is still less than the college average but would be in step with the change we saw in 240).

2. Average Class Size

	2020-2021		2021-2022		2022-2023		Three-Year	
	Sections	**Average Size**	**Sections**	**Average Size**	**Sections**	**Average Size**	**Average Section Size**	**Trend**
PHYS-110	5	29.8	3	33.3	3	32.3	31.5	8.5%
PHYS-111	2	20.0	2	9.5	2	14.5	14.7	-27.5%
PHYS-120	2	20.0	2	18.0	2	18.5	18.8	-7.5%
PHYS-121	1	15.0	1	13.0	1	11.0	13.0	-26.7%
PHYS-140	4	25.5	3	19.7	4	14.5	19.9	-43.1%
PHYS-240	3	22.3	2	24.0	3	16.3	20.5	-26.9%
PHYS-241	2	24.5	2	32.5	1	25.0	27.8	2.0%
ASTR-110	5	41.6	3	39.7	3	42.0	41.2	1.0%
Program Average*	**24**	**27.9**	**18**	**25.5**	**19**	**22.7**	**25.6**	**-18.6%**
Institutional Average*	**1,199**	**25.3**	**1,112**	**22.7**	**1,009**	**23.3**	**23.8**	**-8.2%**

Sources: SQL Queries for Fall 2023 Program Review for enrollment data, Enrollment Management Division Reports and Concurrent Courses Reports for course-section data.

Average Section Size across the three-year period for courses, and both within academic years and across the three-year period for the program and institutional levels is calculated as:

$$\frac{\text{Total \# Enrollments}}{\text{Total \# Sections}}.$$

It is not the average of the three annual averages.

RPIE Analysis: Over the past three years, the Physics and Astronomy Program has claimed an average of 25.6 students per section. The average class size in the program is higher than the average class size of 23.8 students per section across the institution during this period. Average class size in the program decreased by 18.6% between 2020-2021 and 2022-2023. Average class size at the institutional level decreased by 8.2% over the same period.

Average class size in the following courses changed by more than 10% (±10%) between 2020-2021 and 2022-2023:

Courses with decreases in average class size:

- *PHYS-140 (-43.1%)*
- *PHYS-111 (-27.5%)*
- *PHYS-240 (-26.9%)*
- *PHYS-121 (-26.7%)*

Program Reflection:

We have tried to retain high fill rates by cutting sections as needed, this kept us with a higher average class size than the college norm over these three years. However, we still saw decline over the three years.

PHYS-110: enrollment has regularly been above capacity since we began it running only as a single section of PHYS-110 each semester.

PHYS-140: we keep multiple sections open (typically 2 sections/semester) to offer more than one timeslot and not further reduce our enrollments. Keeping these 2 sections is critical so that students can take other STEM courses in their educational plans with out conflict. However, we do shrink the sections as the 140/240/241 sequence progresses.

PHYS-240: as the 140 enrollments decreased, we saw a corresponding decrease in the class size for the next course in the sequence, 240. However, the decline in 240 was not as much as 140, showing good retention in that 2nd semester course.

PHYS-111: typically, some percentage of physics 110 students elect to concurrently take 111 lab. Since the number of sections for 110 dropped, the pool of students who may take 111 is also smaller. PHYS-111 is a part of the Machine Tool Technology program. We have conferred with that program to coordinate the best timing for their students.

PHYS-121: with a starting size of 15 students in 2020-2021, I am unclear if the reduction is a trend or small statistics fluctuation. This is said particularly considering the relative success of the first semester course, PHYS-120.

3. Fill Rate and Productivity

Fill Rate

	Enrollments	Capacity	Fill Rate
2020-2021	670	719	93.2%
2021-2022	459	513	89.5%
2022-2023	432	521	82.9%
Three-Year Program Total	**1,561**	**1,753**	**89.0%**
Productivity			
	FTES	**FTEF**	**Productivity**
2020-2021	103.0	7.2	14.3
2021-2022	76.3	5.9	12.9
2022-2023	67.0	5.9	11.4
Three-Year Program Total	**246.3**	**19.0**	**13.0**
Sources: SQL Queries for Fall 2023 Program Review; SQL Server Reporting Services – Term to Term Enrollment FTES Load Comparison Report (by Credit Course)			

RPIE Analysis: Between 2020-2021 and 2022-2023, the fill rate within the Physics and Astronomy Program ranged from 82.9% to 93.2%. (The fill rate has not been calculated at the institutional level.) The program-level fill rate decreased across the three-year period. The rate across the three years was 89.0%. Between 2020-2021 and 2021-2022, both enrollment and capacity decreased, resulting in a decrease in fill rate (due to a higher rate of decrease in enrollment). Between 2021-2022 and 2022-2023, enrollment decreased while capacity increased, resulting in a decrease in fill rate.

Productivity within the Physics and Astronomy Program ranged from 11.4 to 14.3 over the three-year period. (Productivity has not been calculated at the institutional level.) The three-year program productivity of 13.0 is lower than the target level of 17.5, which reflects 1 FTEF (full-time equivalent faculty) accounting for 17.5 FTES (full-time equivalent students) across the academic year. (This target reflects 525 weekly student contact hours for one full-time student across the academic year.)

Program Reflection:

Our hope is that the incoming students' calculus pass rates will increase and the calculus-based physics enrollments will increase. That outcome would directly support these programs: physics, engineering, and computer science. To allow for this rebound, we should keep the existing sections.

If we want to keep the calculus sequence sections and increase productivity, we should consider adding more GE course sections (PHYS-110 and ASTR-110) provided we are able to fill them to capacity.

Since GE courses online in our discipline have been exceedingly more popular than GE courses in person, doing this would likely mean adding more **online GE sections**. The program coordinator's impression is that administration has, at times, discouraged adding more online sections. We respectfully suggest that modality decisions be data-driven.

4. Labor Market Demand

This section does not apply to the Physics and Astronomy Program, as it is not within the Career Technical Education Division.

B. Momentum

1. Retention and Successful Course Completion Rates

	Retention Rates (Across Three Years)			Successful Course Completion Rates (Across Three Years)		
Course	Rate	Course Rate vs. Program Rate		Rate	Course Rate vs. Program Rate	
		Above	Below		Above	Below
PHYS-110	97.4%	***X***		86.4%	X	
PHYS-111	96.6%	X		94.3%	***X***	
PHYS-120	65.7%		***X***	63.0%		***X***
PHYS-121	100%	***X***		97.4%	***X***	
PHYS-140	89.0%		***X***	80.5%		X
PHYS-240	95.6%	X		91.8%	***X***	
PHYS-241	97.8%	***X***		90.5%	***X***	
ASTR-110	92.7%	--		78.0%		***X***
Program Level	92.5%			83.1%		
Institutional Level	**90.0%**			**72.7%**		

Source: SQL Queries for Fall 2023 Program Review
-- Indicates a value that is within 1% of the program-level rate.
Bold italics denote a statistically significant difference between the course-level rate and the program-level rate.
Bold denotes a statistically significant difference between the program-level rate and the institutional rate. The lower of the two rates is highlighted in bold.
Note: Grades of EW (Excused Withdrawal) for spring 2020 and beyond are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.

RPIE Analysis: Over the past three years, the retention rate for the Physics and Astronomy Program was significantly higher than the retention rate at the institutional level. The retention rates for PHYS-120 and PHYS-140 were significantly lower than the program-level rate. The retention rates for PHYS-110, PHYS-121, and PHYS-241 were significantly higher than the program-level rate. The retention rate for the Physics and Astronomy Program falls within the third quartile (Q3) among program-level retention rates (across 58 instructional programs, over the past three years). The retention rate for Physics and Astronomy is among the highest 50% of retention rates among NVC programs.

Over the past three years, the successful course completion rate for the Physics and Astronomy Program was significantly higher than the rate at the institutional level. The successful course completion rates for PHYS-120 and ASTR-110 were significantly lower than the program-level rate. Physics and Astronomy courses with successful course completion rates significantly higher than the program-level rate are noted in the table above. The successful course completion rate for Physics and Astronomy falls within the third quartile (Q3) among program-level successful course completion rates (across 58 instructional programs, over the past three years). The successful course completion rate for Physics and Astronomy is among the highest 50% of successful course completion rates among NVC programs.

Over the past three years, the difference between retention and successful course completion at the program level (9.4%) was significantly lower than the difference at the institutional level (17.3%). This figure represents the proportion of non-passing grades assigned to students at the end of the semester (i.e., grades of D, F, I, NP).

No Physics and Astronomy courses claimed a difference (between retention and successful course completion) that exceeded the 17.3% difference found at the institutional level.

Program Reflection:

We note that the program retention and course completion rates in our program exceed the institutional level. It makes sense that the lowest retention and course completions would be for our introductory sequence courses, PHYS-140 and PHYS-120. During those courses, students typically get up to speed on what it takes to succeed in the sequence.

2. Student Equity

	Retention Rates (Across Three Years)		Successful Course Completion Rates (Across Three Years)	
	Program Level	**Institution Level**	**Program Level**	**Institution Level**
African American/Black	93.9%	87.7%	87.9%	***65.9%***
Pacific Islander	90.0%	86.7%		
Latinx/Hispanic			80.5%	***69.0%***
19 or Younger			84.1%	***71.0%***
First-Generation			79.1%	***69.7%***
Not Disabled/Not Reported			83.5%	***72.5%***

Source: SQL Queries for Fall 2023 Program Review

Bold italics denote a statistically significant difference between rates at the program and institutional levels, with the lower of the two rates in ***bold italics***.

*Data suppressed due to low N (<10 students in cohort).

Notes:

Grades of EW (Excused Withdrawal) for spring 2020 and beyond are not included in the calculations of the three-year retention and successful course completion rates reported above. This approach reflects the standard recommended research practice of not including EWs in either the numerator or the denominator for these rates.

The age groupings are based on the student's age of August 15 of each academic year.

The shaded cells in the table do not have data reported because evidence of disproportionate impact was not found at the institutional level (for those demographic group – metric combinations).

RPIE Analysis: This analysis of student equity focuses on the six demographic groups with significantly lower retention and/or successful course completion rates found at the institutional level (vs. the corresponding rates among all other demographic groups, combined) over the past three

years. Tests of statistical significance were conducted to compare program-level and institution-level rates among the six groups listed above.

Within the Physics and Astronomy Program, the retention rates among African Americans/Blacks and Pacific Islanders were higher than the rates at the institutional level. (The differences were not statistically significant.)

Within the Physics and Astronomy Program, the successful course completion rates among African American/Black students, Latinx/Hispanic students, students 19 and younger, first-generation students, and students without a disability reported were significantly higher than the corresponding rates at the institutional level.

These findings regarding equity groups deviate from findings that emerged from the comparison of retention and successful course completion at the program vs. institutional level, where the program-level rates were significantly higher than the rates at the institutional level. (See Section I.B.1 above.)

Program Reflection:

We note that the retention and successful course completion rates in our program exceed the institutional average rates for all identified demographic groups of concern. Possible reasons for this include faculty in our program that come from under-represented groups in STEM, strong collaboration with the MESA program, and on intrusive counseling practices.

3. Retention and Successful Course Completion Rates by Delivery Mode (of Courses Taught through Multiple Delivery Modes, i.e., In-Person, Hybrid, and Online) cf

	Retention Rates (Across Three Years)			Successful Course Completion Rates (Across Three Years)		
	In-Person	Online	Hybrid	In-Person	Online	Hybrid
Online vs. Hybrid						
PHYS-111		85.7%	100%		85.7%	100%
PHYS-140		91.2%	87.5%		88.2%	***62.5%***
PHYS-240		*	*		*	*
Program Total		91.2%	96.2%		89.5%	87.3%

Source: SQL Queries for Fall 2023 Program Review
This table compares student performance in courses offered through multiple delivery modes within the same academic year.
Bold italics denote a significantly lower rate within that delivery mode.
*Data suppressed due to low N (<10 students in cohort).

RPIE Analysis: Over the past three years, three courses within the Physics and Astronomy Program have been offered through at least two delivery modes within the same academic year. In 2022-2023, PHYS-111, PHYS-140, and PHYS-240 were offered through online and hybrid formats. This analysis focuses on program-level rates. Details for the course level are reported in the table above. PHYS-240 is not reported separately because less than 10 students enrolled in the online format, but it is included in the analysis at the program level.

Within the Physics and Astronomy Program:

- *The retention rate in online sections was lower than the retention rate in hybrid sections. (The difference was not statistically significant.)*
- *The successful course completion rate in hybrid sections was lower than the successful course completion rate in online sections. (The difference was not statistically significant.)*

Program Reflection:

The delivery method data was not statistically significant to determine whether online or hybrid was a more successful format.

One potential reason for less successful completion of hybrid courses compared to online is that our hybrid courses use in-person testing. We had many incidents of academic honesty policy violations in online exams during the pandemic. In-person testing prohibits most academic honesty violation types and may be a more accurate representation of student learning.

C. Student Achievement

1. Program Completion

	2020-2021	2021-2022	2022-2023
Degrees			
Physics: AS-T	24	20	16
Institutional: AS-T Degrees	**131**	**110**	**111**
Source: SQL Queries for Fall 2023 Program Review			

RPIE Analysis: The number of AS-T degrees conferred by the Physics and Astronomy Program decreased by 33.3% between 2020-2021 and 2022-2023. Over the same period, the number of AS-T degrees conferred by the institution decreased by 15.3%. The Physics and Astronomy Program accounted for 18.3% of the AS-T degrees conferred in 2020-2021 and 14.4% of those conferred in 2022-2023.

Program Reflection:

One possible reason for the decline in physics AS-Ts is the decline in students passing mathematics pre-requisites to the series. However, these numbers are also low for statistical analysis.

2. Program-Set Standards: Job Placement and Licensure Exam Pass Rates

This section does not apply to the Physics and Astronomy Program, as it is not within Career Technical Education or Health Occupations.

II. CURRICULUM

A. Courses

Subject	Course Number	Date of Last Review & Approval by	Has Prerequisite/ Corequisite* *Yes/No*	In Need of Revision *Indicate Non-Substantive (NS)*	To Be Archived *(as Obsolete, Outdated, or Irrelevant)*	No Change

		Curriculum Committee *(Courses with last review dates of 6 years or more must be scheduled for immediate review)*	**& Date of Last Review**	*or Substantive (S)* **& Academic Year Anticipated**	**& Academic Year Anticipated**	
ASTR	110	Cannot find	No	NS	2024-2025	
PHYS	110	Cannot find	No	NS	2024-2025	
PHYS	111	Cannot find	Yes	NS	2024-2025	
PHYS	120	4/19/2015 (BOT)	Yes	NS	2024-2025	
PHYS	121	Cannot find	Yes	NS	2024-2025	
PHYS	140	1/19/2012 (BOT)	Yes	NS	2024-2025	
PHYS	199	Cannot find	No	NS	2024-2025	
PHYS	240	1/19/2012 (BOT)	Yes	NS	2024-2025	
PHYS	241	1/19/2012 (BOT)	Yes	NS	2024-2025	

*Note: Prerequisites need to be validated (in subsequent process) through Curriculum Committee.

B. Degrees and Certificates[+]

Degree or Certificate & Title	**Implementation Date**	**Has Documentation** ***Yes/No***	**In Need of Revision+** ***and/or Missing Documentation*** **& Academic Year Anticipated**	**To Be Archived*** ***(as Obsolete, Outdated, or Irrelevant)*** **& Academic Year Anticipated**	**No Change**
Physics: AS-T		Yes			X

*Note: Discontinuance or archival of degrees or certificates must go through the Program Discontinuance process or the Program Archival Task Force.

+Degrees and Certificates cannot be implemented until the required courses in them are approved and active.

Program Reflection:

No changes are needed to the Physics AS-T

III. LEARNING OUTCOMES ASSESSMENT

A. Status of Learning Outcomes Assessment

Learning Outcomes Assessment at the Course Level

	Number of Courses with Outcomes Assessed		Proportion of Courses with Outcomes Assessed	
Number of Courses	Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
10	4	8	40%	80

Learning Outcomes Assessment at the Program/Degree/Certificate Level

Degree/Certificate	Number of Outcomes*	Number of Outcomes Assessed		Proportion of Outcomes Assessed	
		Over Last 4 Years	Over Last 6 Years	Over Last 4 Years	Over Last 6 Years
Physics: AS-T	3	3	3	100%	100%

Program Reflection:

Of our currently active courses, 100% have been assessed within the last 6 years.

The data provided by RPIE is based on **an old pull** and includes **courses that have been archived.** PHYS 250 archival was approved 02/16/23, with last edits 10/19/2022. ASTR 111 was archived and does not appear at all in CourseLeaf. RPIE is aware that archived courses are in this data pull and chose to include them in the data.

The data also includes the independent study course Phys 199 which has not been used in over 6 years. We retained PHYS 199 when going through archival because, at the time, we had reason to believe we may have needed to use it during the pandemic as a stop-gap for cancelled courses.

Here are the dates for each SLO assessment of our active courses. As you can see, they fall within the last 6 years for all courses. By my calculation, 85.7% of the courses (6 out of 7) were assessed during the last 4 years.

Single SLO courses	SLO 1
Phys 111	7/6/22

Two-SLO courses	SLO 1	SLO 2
Phys 110	7/6/22	1/22/19

Three-SLO courses	SLO 1	SLO 2	SLO 3
Astr 110	9/11/23	9/11/23	9/11/23
Phys 120	5/29/21	5/29/21	5/29/21
Phys 121	5/30/21	5/30/21	5/30/21
Phys 140	6/10/23	6/1/23	6/1/23
Phys 240	12/23/22	12/23/22	12/23/22
Phys 241	1/31/19	1/31/19	1/31/19

B. Summary of Learning Outcomes Assessment Findings and Actions

Across our program, although we typically pass all SLO benchmarks, we find that out of qualitative learning, quantitative learning, and laboratory skills, students are assessed the weakest on qualitative learning.

Program Reflection:

This result makes sense in that calculating results is a main component of physics questions. However, qualitative reasoning is important for understanding the material and interpreting any calculations students accomplish. We have taken steps to improve this such as increasing the number of qualitative questions asked on homework assignments in order for students to practice this skill.

IV. PROGRAM HIGHLIGHTS

The program-level plan that emerged from the last review (fall 2020) included the following initiatives:

- Investigate calculus supplement for pre-health track
- Lab laptop refresh
- Computer lab refresh
- Lab equipment refresh
- Shift to using Open Resources

A. Accomplishments/Achievements Associated with Most Recent Three-Year Program-Level Plan

Computers were refreshed (physics lab laptops and GIS lab desktops), new lab equipment was purchased, and the pre-health physics, pre-engineering physics, and astronomy courses switched to no-cost textbooks. Physics 110 and 111 do not require a text, thus our courses are zero textbook cost.

B. Recent Improvements

(see other comments about new computers, equipment, and no-cost textbooks)

C. Effective Practices

Student centered practices have led us to switch to no-cost textbooks in all PHYS and ASTR courses, except for PHYS 110 at this time.

Refreshed laptops in the physics lab ensures that all students can access a computer in lab, which supports student equity.

V. PROGRAM PLAN

Based on the information included in this document, the program is described as being in a state of:

- ○ Viability
- ○ Stability
- ○ Growth

*Please select ONE of the above.

This evaluation of the state of the program is supported by the following parts of this report:

Physics courses are required for pre-engineering, pre-health, and Machine Tool Technology students. While enrollments have decreased in last three years, there is still a need for these courses. The program has performed well across all measured equity groups.

Complete Columns A – D of the 3-Year Program Planning Template (Excel file accompanying this report) to outline the three-year plan for the program. For the fall 2023 program review cycle, the 3-year program plan will span 2024-2025 through 2026-2027.

COLUMN A	COLUMN B	COLUMN C	COLUMN D
Program/Service	**Unit-Level Initiative**	**Anticipated Year of Implementation**	**Anticipated Outcome of Initiative**
Physics and Astronomy	hire maker lab physics intern to develop teaching demos and research adding a circuits lab	2024-2025	Improvement of student experience
Physics and Astronomy	make Physics AS-T a fully ZTC degree	2026-2027	reduction in student cost, close equity gap
Physics and Astronomy	create problem solving/testing room that with electronic tablets for digital submission of handwritten work.	2023-2024 (Current)	make collection and storage of SLO data easier, address equity issues by familiarizing all students with electronic writing devices
Physics and Astronomy	expand Supplemental Instruction program	2024-2025	offer up to 2 Sis per physics course
Physics and Astronomy	update CORs which lost their date stamp in Nuventive	2024-2025	ensure that CORs and texts are current

VI. RESOURCES NEEDED TO IMPLEMENT PROGRAM PLAN

a. Describe the current state of program resources relative to the plan outlined above. (Resources include: personnel, technology, equipment, facilities, operating budget, training, and library/learning materials.) Identify any anticipated resource needs (beyond the current levels) necessary to implement the plan outlined above.

Description of Current Program Resources Relative to Plan:

We have a Program Coordinator but would benefit from:

- Staffing: expanded Maker Lab staffing and Supplemental Instruction Program Staffing (more student SIs and an SI coordinator).
- Technology improvements, specifically digital writing tablets for handwritten student work. Implicitly, we request continued support of our existing technology, for example instructor tablets for online teaching, laptops in the physics lab, and instructional equipment in our classrooms.
- Grant support: we are applying for a grant to make the Physics AS-T fully zero textbook cost (ZTC) and request continued support of the college in administering grants. It would be helpful to have a stipend process to simplify requests.

b. Complete Columns E – F of the 3-Year Program Planning Template to identify the resources needed in order to implement each unit-level initiative. If more than one type of resource (e.g., operating expenses, technology, supplies, facilities, equipment, etc.) is needed to implement the initiative, list them on consecutive rows following the unit-level initiative.

Note: Resources to support program plans are allocated through the annual planning and resource allocation process (not the program review process).

The completed 3-Year Program Planning Template will serve as a draft/starting point for upcoming annual planning and resource allocation cycles.

COLUMN A	COLUMN B	COLUMN C	COLUMN D	COLUMN E	COLUMN F
Program/ Service	**Unit-Level Initiative**	**Anticipated Year of Implementation**	**Anticipated Outcome of Initiative**	**Description of Resource Need**	**Type of Resource Need**
Physics and Astronomy	hire maker lab physics intern to develop teaching demos and research adding a circuits lab	2024-2025	Improvement of student experience	Part time Maker Lab staff or intern	Staffing
Physics and Astronomy	make Physics AS-T a fully ZTC degree	2026-2027	reduction in student cost, close equity gap	funding for faculty release time. In process of applying for ZTC grant through	Other

				Chancellor's office	
Physics and Astronomy	create problem solving/testing room that with electronic tablets for digital submission of handwritten work.	2023-2024 (Current)	make collection and storage of SLO data easier, address equity issues by familiarizing all students with electronic writing devices	Writing tablets for GIS lab and/or Physics lab laptops	Technology
Physics and Astronomy	expand Supplemental Instruction program	2024-2025	offer up to 2 Sis per physics course	Funding for more SIs and an SI coordinator	Staffing
Physics and Astronomy	update CORs which lost their date stamp in Nuventive	2024-2025	ensure that CORs and texts are current	No additional resources needed/program coordinator can do this.	Staffing

PHYSICS AND ASTRONOMY FALL 2023

Completed by Supervising Administrator:

her Farmer, Dean Science & Engineering

Date:

11-30-2023

Strengths and successes of the program, as evidenced by analysis of data, outcomes assessment, and curriculum:

The Physics program is the backbone of our science programs. Coursework in physics is part of almost all STEM degree and transfer pathways. The strength of the program lies largely with the faculty and their dedication to provide a solid foundational understanding of physics to our STEM students while also be willing to experiment with different teaching methodologies and approaches to enhance student success.
The program's strong ties to the MESA program create a valuable sense of community amongst its students. This is evidenced by the program's higher than institutional level retention and successful course completion rates – which is not often the case in math-based problem-solving curriculum.
The faculty in the program are commended for utilizing a variety of modalities, including modified hy-flex and other online approaches to increase student access to their classes. This, along with other initiatives such as a push for low/zero cost texts are indicative of a student centric faculty that are dedicated to the academic success of their students.

Areas of concern, if any:

Decreasing enrollments in Physics that outpace the institutions decline in enrollments during the same time period presents a challenging obstacle as there is no anticipated increase in the NVC student body currently anticipated. With most of our physics offerings being multi-course sequences, maintaining a healthy funnel of students to ensure access to, and regular offering of all the courses in the sequences is vital. An inability to continue offering physics sequences in this manner would be detrimental to the success of students needing these courses for their major(s).

Recommendations for improvement:

As noted, the maker space located on the bottom level of the 1800 building is an underutilized asset to the physics department. Investment in this space will benefit not only the physics program, but all of the STEM programs tied to physics. The makerspace is small and cramped, and does not provide an aesthetic conducive of an educational space. It is recommended that the college invest in the further development of the makerspace and that curriculum be derived that utilizes it as a learning resource.
Additionally, Physics, along with the other physical sciences is located in the 1800 building. This building is long overdue for enhancement. Labs are not ADA compliant, storage is cramped and jumbled, classrooms are small and lack up to date technology and the building overall contains a plethora of sign of its age and lack of upkeep (ceiling tiles falling, rusting sinks, dripping faucets, etc). While it is acknowledged that the college does not have the resources to replace the physical science building, investment in its upkeep may go a long way in providing a healthy and stimulating learning environment for STEM students.

Additional information regarding resources: