Physics Annual Assessment 2019-2020

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Annual Assessment 2019-2020

Physics

Program Profile

Program Mission Statement
Please insert your program mission statement here

The primary objective of the physics program is to help students learn to develop and accurately apply mathematical and analytical processes to descriptions and models of systems in the natural world. This is done through hands-on lab work, original research, and traditional coursework. The skills acquired in this program will prepare students to pursue a wide range of technical careers as well as further education.

Program Data

Delivery Method

Traditional On Campus (selected)
Online
Hybrid

Student Majors 2018-19	Student Minors 2018-19
3	4

Students Majors 2019-2020	Student Minors 2019-20
3	3

Concentrations 2018-19
If your program contains concentrations, please list the concentrations and the number of students identified within each concentration.

N/A

Concentrations 2019-20
If your program contains concentrations, please list the concentrations and the number of students identified with each concentration.

N/A

Student Demographics
What are the program goals for student retention, persistence and degree completion? What do the persistence numbers mean to the faculty in the program? Are your persistence numbers what you expected? If not, how could the numbers be improved? What is the optimal enrollment for the program?

The program has the following goals for retention and growth during the 2018-2019 school year:

-Retain all current physics majors and recruit one additional physics major

-Retain at least 90% of the current physics minors and recruit two additional physics minors

These goals will help to ensure that the programs remain viable going forward. Both degrees have been monotonically increasing in enrollment since their introduction. While this growth is expected to remain relatively slow, the goal is to maintain a steady increase. Both programs could grow significantly before reaching optimal enrollment.

Is the Program Externally Accredited

Yes
No (selected)

External Accreditation
Name the Accrediting Agency or entity including the last review/approval. Is there an accrediting body for the field of study? If yes, what is the name of the group. Is the program seeking accreditation? If no, why?

There are currently no accrediting agencies for a program of this type.

Marketing Materials
Please reflect on the current marketing materials used for the program. Detail what documents you are reviewing and attach a screenshot of any webpages or materials that you cannot include as a document. What changes, if any should be made to the material? Are there recommendations for how or where to market the program?

Marketing Material

Program Assessment

Standard/Outcome

Identifier	Description
WWU2016.1	Major Field Competence: Students will demonstrate excellence in an academic or professional discipline, and engage in the process of academic discovery.
WWU2016.2	Ethics: Students will exhibit values and behaviors that address self- respect and respect for others that will enable success and participation in the larger society.
WWU2016.3	Self-Liberation: Students will develop an honest understanding and appreciation of themselves and others resulting in an ability to make individual decisions.
WWU2016.4	Lifelong Education: Students will possess an intellectual curiosity and desire for continual learning both within and beyond formal education in preparation for participation in a global society.

Additional Standards/Outcomes

Identifier	Description
PHY.1	Students will achieve an advanced understanding and appreciation for the physical laws governing the universe, through conceptual problem solving and laboratory experience.
PHY.2	Students will learn to model and simulate complex physical interactions computationally, they will design, construct, and program experimental apparatuses to test theories.
PHY.3	Students will develop sophisticated mathematical and numerical skills, allowing them to quantitatively understand and predict the behavior of physical systems.
PHY.4	Students will practice the scientific method and the processes involved in conducting original scientific research, along with the communication and presentation of their findings.

Alignment to the University Objectives
Please discuss the program alignment to the University Objectives. We do not need an artifact for each objective, but a discussion on how the program uses the Institutional Objectives as an anchor for their program curriculum.

Physics teaches more than just how the universe operates at a basic level. It teaches problem solving. It teaches students how to think for themselves and arrive at evidence based conclusions. Physics students are taught that no problem is too complicated. Provided with a problem, they are trained to take it apart, determine the important parameters, explore possible outcomes and discover new, elegant ways to reach a solution. In doing so, thier confidence and ability improve so that they can enter the world equipped with the tools they need to help tackle the problems of our society through logical, quantitative analysis.

General Education Alignment to Program
How do the General Education criteria align with the Program Objectives? What courses within your program build upon skills learned in general education courses (please list the program course and the general education criteria). The General Education clusters are: Critical Analysis, Creative Expression, Quantitative Inquiry, and Society & the Individual. See attached for more detailed breakdown.

Critical Analysis:

Students are expected to apply logical and analytical reasoning skills to diverse source material when they conduct literature reviews in PHY 490 - Senior Research. This course often involves case studies and independent investigation in which students must use recent literature to guide their research direction. Students are often expected to read original articles and determine objectives for future research. These skills build upon and are consistent with the description given for critical thinking.

Creative Expression:

Throughout the physics program, students are required to express physics concepts both visually through detailed graphs and figures in lab reports (PHY 202 – Physics Lab 1, PHY 212 – Physics Lab 2) and orally through presentations:

- PHY 201 (Physics 1): Students are required to give a presentation where they explain and solve a physics problem in front of the class. Presentations are 5 minutes.
- PHY 315 (Modern Physics): Students are required to give a presentation on a technological application made possible by a discovery made in modern physics. Presentations are 10 minutes and requires the student to perform independent research.
- PHY 480 (Numerical Physics): Presentation of a numerical solution to a physics problem to non-experts. Students are tasked with a difficult physics problem that cannot be solved exactly which requires the use of a computer algorithm to solve the problem numerically. Students are then asked to give a detailed presentation of the problem, the solution, and the results to a group of students below their level of physics knowledge in order to practice talking to non-peers about scientific concepts. Presentations should be 25-30 minutes and completely outline their project and results.

Quantitative Inquiry:

Quantifying the laws that govern our universe is the bedrock of physics. As such, every course in physics helps students develop and practice quantitative problem-solving skills.

Society and the Individual:

PHY 315 (Modern Physics) covers the last century of physics which saw a significant physics revolution in the early 20th century. Emphasis is placed on the historical aspect of physics and the implications it had on shaping the world throughout the 20th century though the development of nuclear, atomic, and quantum physics. Students are asked to contemplate the future of physics and any impacts it will have on our society as we become a technological civilization.

GE_Cluster_Descriptions_FINAL_Version_Approved.docx

NSSE Objectives Discussed Fall 2019

Program Alignment to NSSE Objectives
How did your program integrate the three NSSE objectives determined by the faculty this fall. The objectives were to 1) integrate more interdisciplinary work within the curriculum, 2) to connect learning to societal problems or issues, and 3) to examine the strengths and weaknesses of their (students) own views on a topic or issue. Please articulate which courses, and what assignments were assigned and how the work was assessed. Were the assignments successful? What could have made them more successful?

1. Unfortunately, due to the campus closing mid-march, plans for interdisciplinary work was abandoned. This will be picked up again in future semesters.

2. My physics students were tasked with brainstorming ideas for reducing the need for chemical fuels through the use of electromagnetism as a way of helping push humanity toward newer, and less environmentally destructive means for propulsion. This topic will be explored further during my seniors' research practicum next year.

3. While not part of the physics program, in the course Foundations of Science, students were asked to write a report in which they would examine, and strengthen their argument through valid research, their position on climate change. They were tasked in participating in a hypothetical argument with a climate change denier and what sources of evidence they would use to the contrary in order to convince the other person.

Curriculum Map

A - Assessed
R - Reinforced
I - Introduced
M - Master

Physics

	PHY 201	**PHY 202**	**PHY 212**	**PHY 213**	**PHY 315**	**PHY 318**	**PHY 321**	**PHY 360**	**PHY 381**	**PHY 382**	**PHY 421**	**PHY 422**	**PHY 450**	**PHY 460**
PHY.1 Students will achieve an advanced understanding and appreciation for the physical laws governing the universe, through conceptual problem solving and laboratory experience.	I, A	I, A	R	R	M, A		R				R	R		
PHY.2 Students will learn to model and simulate complex physical interactions computationally, they will design, construct, and program experimental apparatuses to test theories.		I		A, I		R			R	R			M, A	
PHY.3 Students will develop sophisticated mathematical and numerical skills, allowing them to quantitatively understand and predict the behavior of physical systems.	I		I				A, R				M	M		
PHY.4 Students will practice the scientific method and the processes involved in conducting original scientific research, along with the communication and presentation of their findings.					I			R						R

	PHY 480	PHY 490	MAT 124	MAT 214	MAT 215	MAT 224	MAT 312
PHY.1 Students will achieve an advanced understanding and appreciation for the physical laws governing the universe, through conceptual problem solving and laboratory experience.	M						
PHY.2 Students will learn to model and simulate complex physical interactions computationally, they will design, construct, and program experimental apparatuses to test theories.	M, A						
PHY.3 Students will develop sophisticated mathematical and numerical skills, allowing them to quantitatively understand and predict the behavior of physical systems.			R	R	R	R	R
PHY.4 Students will practice the scientific method and the processes involved in conducting original scientific research, along with the communication and presentation of their findings.		M, A					

Changes to Curriculum
Are there any changes made to the curriculum map for this academic year? If so, please describe the program changes made along with the rationale for why and the impact the change should have on student learning?

Assessment Findings

Assessment Findings for the Assessment Measure level for Physics

PHY.1 Students will achieve an advanced understanding and appreciation for the physical laws governing the universe, through conceptual problem solving and laboratory experience.

PHY 201

Assessment Measure	Criterion	Summary	Attachments of the Assessments	Improvement Narratives
Direct - Class Assignment	Has the criterion A minimum of 85% of students will achieve an overall homework score of >85% been met yet? Met	23 out of 27 students (85%) achieved >85% on their overall homework score. Of the 4 students who did not make the cut, 3 were due to severe negligence and turned in less than 50% of the homework assignments. The class average for homework as an 89.6% with a 19.1% standard deviation. The standard deviation was so high due to the very low percentages of the 3 aforementioned students.		

PHY 202

Assessment Measure	Criterion	Summary	Attachments of the Assessments	Improvement Narratives
Direct - Class Assignment	Has the criterion At least 90% of students will	Only 23/27 students (85%) completed all lab reports. Of the 4 remaining, 1 student only missed 1 lab, while the other 3 missed		- Curriculum Revision: In future, a policy

	complete all lab reports. been met yet? Not met	several due to severe academic negligence (not turning in work).		will be put in place that automatically fails any student who misses more than 2 labs in the semester. It is hoped that this incentive will elicit a better work ethic among the students.

PHY 315				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
Direct - Quiz/Exam	Has the criterion An average score of 80% or greater on in-class exams been met yet? Met	All students achieved an average exam score greater than 80%. The class average for all exams was a 91.67%.		

PHY.2 Students will learn to model and simulate complex physical interactions computationally, they will design, construct, and program experimental apparatuses to test theories.

PHY 213				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
	Has the criterion At least 90% of students will complete all lab reports. been met yet? Not met	4/23 students did not complete every lab. With going online, many students struggled to keep up with online lab reports.		- Curriculum Revision: In future, stricter penalties for labs will be enforced. Students will be warned that missing more than 2 labs will result in failure of the entire course.

PHY 450				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
Direct - Class Assignment	Has the criterion An average score of 85% on student-designed experiments. been met yet? Not met	Course did not meet this semester.		

PHY 480				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
Direct - Class Assignment	Has the criterion An average score of 80% on course programming assignments. been met yet? Met	Both students achieved a 100% average on all course programming assignments.		

PHY.3 Students will develop sophisticated mathematical and numerical skills, allowing them to quantitatively understand and predict the behavior of physical systems.

PHY 321				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
Direct - Quiz/Exam	Has the criterion An average score of 80% on in-class exams. been met yet? Not met	Course did not meet this year.		

PHY.4 Students will practice the scientific method and the processes involved in conducting original scientific research, along with the communication and presentation of their findings.

PHY 490				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
	Has the criterion All students will successfully compose a senior thesis. been met yet? Not met	Course did not meet this year.		

Analysis of the Assessment Process

Describe your assessment process; clearly articulate how the program is using course work and or assessment day activities for program assessment. Note any changes that occurred to that process since the previous year. Discuss what activities were successful at assessment and which ones were not as helpful and why. Please include who met to discuss the changes (unless you are a program of one person) and when you met. – Include a discussion on the process for collection and analysis of program data.

Improvement Narrative List

Assessment Findings for the Assessment Measure level

Standard/Outcome	PHY.1 Students will achieve an advanced understanding and appreciation for the physical laws governing the universe, through conceptual problem solving and laboratory experience.
Legend	A
Course/Event	PHY 202
Assessment Measure	Direct - Class Assignment
Assessment Findings	Not met
Improvement Narrative	**Improvement Type**: Curriculum Revision **Summary**: In future, a policy will be put in place that automatically fails any student who misses more than 2 labs in the semester. It is hoped that this incentive will elicit a better work ethic among the students.

<table>
<tr><td>Standard/Outcome</td><td>PHY.2 Students will learn to model and simulate complex physical interactions computationally, they will design, construct, and program experimental apparatuses to test theories.</td></tr>
<tr><td>Legend</td><td>A</td></tr>
<tr><td>Course/Event</td><td>PHY 213</td></tr>
<tr><td>Assessment Measure</td><td></td></tr>
<tr><td>Assessment Findings</td><td>Not met</td></tr>
<tr><td>Improvement Narrative</td><td>
<table>
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Program Activities

Student Performance Review

Describe the department assessment day activities if not already described previously. Please articulate the nature of the assessments are conducted, explain the process for assessment that happens on these two days. Include the schedule of assessment day for your program. What does the data and outcomes tell you? What changes will you make as a result of the data? What areas are successful for the program?

First Day:

Part 1: Students are asked to present a problem in physics at a level on par with their recent course material to a panel of math and science faculty.

Part 1: Immediately following the problem presentation, students are interviewed by the faculty and asked about their career goals and their commentary on the physics program.

Second Day:

Part 3: Students are given a general physics test in order to keep track of their mastery of the subject. Some material will be new to them, but over the years, their scores should improve as they continue the coursework and retake the test. The test takes approx. 3 hours.

Student Performance Review Schedule

Upload the program schedule for students during Performance Reviews.

Senior Showcase

Describe program Senior Showcase activities if not detailed previously in the report? What benefit does the program gain from the activities? What if any assessment of students happens during this event? What changes if any will occur due to

what is learned by faculty on Senior Showcase?

No seniors are currently majoring in the program.

Assessment Rubrics
Upload rubrics used for Senior Showcase or Student Performance Reviews for student assessment.

Service Learning
Does the Program include projects/ course content that uses the philosophy of service learning?
Yes
No (selected)

Service Learning Component
If so, how is service learning infused in the coursework within your department? Is service or community engagement in the program mission? Describe the Service Learning Activities that your students and department engaged in this past year. How did the activities improve student learning? How did the activities benefit the community?

LEAD Events
Highlight lead events sponsored by program faculty that are connected to program or general education objectives for the past academic year. Include a total number of lead events program faculty sponsored.

Two LEAD events hosted by Dr. Sean Baldridge. Both were related to the Astronomy Club and involved learning about and looking at certain celestial objects.

Student Accomplishments
Highlight special examples of student successes in the field (academic: mentor-mentee, conference presentations, competitive internship, journal acceptance; extra-curricular: horse show championship, art exhibit). This is for any accomplishments that a student achieved outside of course work or the normal expectations of student success.

N/A

Alumni Accomplishments
Please highlight special examples of any successes of recent graduated alumni (acceptance or graduation graduate school, employment or professional milestones. Include recent graduates.

N/A

Faculty Accomplishments
Highlight special examples of faculty success in the profession/field/content area. This is for any accomplishment of a faculty activity/research/professional nature.
Dr. Baldridge Submitted a Cox Distinguished Professorship proposal for the 20/21 academic year.

Assessment Rubric

	3.000 Exceeds	2.000 Meets	1.000 Falls Below Expectations	N/A
Mission Statement Clearly Articulated weight: 1.000	The mission statement for the program is insightful and forward thinking. It aligns with the University Mission and learning objectives showing a clear alignment between the University and the program.	✓ The mission statement for the program clearly articulated and aligned with the University mission.	The mission statement is minimal at best.	N/A
Comment:				
Reflection on Retention weight: 1.000	The program provides a detailed description on the retention numbers. The program provides new ideas on how to improve retention of their program students or articulates what they are currently doing to keep students in their program.	✓ The program provides a basic reflection on the retention data provided.	The program does not reflect on retention data in a detailed way.	N/A
Comment:				
Defines External Accreditation Standards weight: 1.000	The program provides a detailed explanation of the accreditation organizations within the field along with all the timeline and supplemental information required for accreditation.	The program provides a basic explanation of the accreditation organizations in the field.	The program fails to provide any accreditation information.	✓ N/A
Comment:				
General Education alignment clearly explained weight: 1.000	The program provides a detailed explanation of the General Education criterial and how the basic skills learned are expanded upon in the program. Details include but are not limited to: specific courses, or activities that stretch the knowledge of the specific areas.	✓ The program provides a basic explanation of the General Education curriculum and how the skills learned are expanded in program courses.	The program provides a minimal explanation of the General Education curriculum and how the skills learned are expanded in program courses.	N/A
Comment:				
Curriculum Map alignment weight: 1.000	The curriculum map is detailed and complete.	✓ The curriculum map is complete	The curriculum map is not complete	N/A
Comment:				
Assessment of Objectives weight: 1.000	Assessment of objectives are spread out across the curriculum with a variety of assessment measures and each program objective is assessed a minimum of twice a year.	✓ Each objective is assessed a minimum of 2 times a year or an assessment rotation is explained so that all objectives are assessed. The assessments are not concentrated in one class.	The assessment map is not complete or much of the assessment happens in only one course. Not all objectives are assessed annually, nor is a plan provided on assessment.	N/A
Comment:				
Data Driven Decision-making is explained weight: 1.000	Curricular and assessment changes are articulated and validated through data based decisions. Faculty discuss the data that lead to curricular decisions being made.	✓ Curricular and assessment decisions are made based on data provided in assessment, but detailed alignment is not provided as justification for the change.	Changes are proposed and brought forth with little explanation on the data included in the decision, if data was included in the decision.	N/A
Comment:				

Documentation provided on assessment findings weight: 1.000	The program uploads all rubric and support information to support the claims in the assessment findings along with detailed instructions on the assessment process and data analysis.	✓ The program uploads all rubric and support information to support the claims in assessment findings.	The program did not upload the data to support assessment claims in the assessment findings.	N/A
Comment:				
Analysis of Assessment is complete weight: 1.000	The program completed assessment findings for each component identified, and provided a comprehensive summary of each assessment measure identified in the report.	✓ The program completed the assessment findings for each component and provided a summary for each assessment measure.	The program did not provide a completed assessment findings for each component, nor did they complete the summary for each measure.	N/A
Comment:				
Improvement narratives are selected with intentionality weight: 1.000	The program identified Improvement Narratives that appear to move the program forward and see the bigger picture than only the specific program curriculum options	The program used the provided Improvement Narratives and selected options that made sense to the objectives and issues within the assessment.	✓ The program did not use any improvement narratives, or the ones chosen are not aligned with assessment results.	N/A
Comment:				
Student Performance Review weight: 1.000	The program described and provided a detailed account of Student performance Review activities. Data evidence provided and detailed.	✓ The program provided the schedule and a brief description of Student Performance Review with data of the results.	The program did not provide complete explanation on Student Performance Review nor did they provide data results.	N/A
Comment:				
Senior Showcase weight: 1.000	The program had all senior students participate in Senior Showcase and provided a detailed explanation of their expectation and the presentations presented.	The program described the Senior showcase activities and provided some evidence of what was presented.	Little to no content of Senior showcase was provided.	✓ N/A
Comment:				
Co Curricular activities weight: 1.000	The program detailed the activities of LEAD and other co-curricular programing that was provided throughout the year. They provided numerous events for students.	✓ The program provided a listing of LEAD events and activities provided.	The program provided little to no description of the Co-curricular activities provided throughout the year.	N/A
Comment:				
Faculty, alumni, and Student accomplishments weight: 1.000	The program provided detail updates on successes on Students, Alumni and Faculty with added information explaining the kinds of success that were experienced.	The program provided a listing of information on Students, Alumni, and faculty accomplishments.	The program provided little to no data on students, alumni, faculty accomplishments.	✓ N/A
Comment:				