WILLIAM WOODS
UNIVERSITY

Physics Annual Assessment 2021-2022

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Annual Assessment 2021-2022

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	Student Minors
2020-2021	**3**	**7**
2021-2022	**1**	**6**

Concentrations 2020-2021
If your program contains concentrations, please list the concentrations and the number of students identified within each concentration.

N/A

Concentrations 2021-2022
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 the persistence numbers what the program expected? If not, how could the numbers improve?

The program has the following goals for retention and growth during the 2020-2021 school year:

- Recruit at least 5 minors from the students taking Physics 2 in the Spring

Optimal Enrollment
Considering current human and physical resources, what is the optimal enrollment for the program?
5

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.

Admissions and Marketing Materials
Reflect on the current marketing materials used for the program. Please attach screen shots of the website or any material you are referencing in this section. What changes, if any, should be made to the material? Are there recommendations on how to modify the current material?

Marketing Material

Program Assessment

Standard/Outcome

Identifier	Description
WWU2021.1	Knowledge and Scholarship: Demonstrate current knowledge and educational expertise in an academic or professional discipline engaging students in the process of academic discovery.

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. Specific evidence is not to be uploaded, but discussion is expected of the assignment, and intentionality of how the objective is met with 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, their 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 Program Objectives? What courses within the program build upon skills learned from general education courses (please list the program course and the general education criteria)? The General Education clusters are attached to the document below.

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 the program integrate the three NSSE objectives determined by the faculty in the fall of 2019? 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. Since physics is a science which attempts to "explain everything" it is easy to link it to many other areas of science (or outside science). Since many of my students are biology students, I specifically try to choose examples of physics in the biological world. For example, in modern physics, a lecture was spent discussing how quantum tunneling could be a path for point mutations in DNA.

2 & 3. While this level of physics does not offer a great deal in the way of "societal problems", another course I teach (Foundations of Science) is perfectly poised to address several societal issues and have students examine their own weaknesses on a topic. One such assignment was a paper in which the students were asked to write about climate change in the form of a discussion between themselves (a proponent of climate change) and an imaginary friend (a denier of climate change). Throughout the paper the students are asked to address common misconceptions about climate change based on what they learned in class. This not only reinforces the student knowledge of the subject but helps address many logical fallacies of the arguments against climate change and helps the student learn how to have an intellectual argument based in scientific evidence.

Curriculum Map

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

Physics

	PHY 201	PHY 202	PHY 212	PHY 213	PHY 315	MAT 124
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		R, A		M, A	
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		A, R		
PHY.3 Students will develop sophisticated mathematical and numerical skills, allowing them to quantitatively understand and predict the behavior of physical systems.	I		R		M, A	
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	M	

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?

Since the physics major was removed from the catalog, all courses pertaining to the physics major were removed from the curriculum. The physics minor remains.

Students who were already declared as physics majors will be allowed to complete their coursework therefore the upper-level physics courses will remain on the course offering until those students are cycled though.

Assessment Findings

Assessment Findings for the Assessment Measure level for Physics

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.

Assessment Measures

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? Not met	14/17 (82.4%) students achieved an >85% on homework so this objective was not met. The class average homework score was 86.7%.		- Curriculum Revision: A revision of homework problems to include simpler problems to train students on the concepts before tackling the more difficult problems. Emphasis on the importance of homework in their overall performance on quizzes/exams could alleviate some instances of students not turning in homework assignments.

PHY 212				
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	12/12 (100%) of students achieved >85% on all homework assignments.		

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	Class average on all exams was 85.7%.		

Standard/Outcome

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

Assessment Measures

PHY 202				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
Direct - Class Assignment	Has the criterion At least 90% of students will achieve >90% on "Lab 9 - Gravity" where students are asked to come up with their own experiment to measure the acceleration of gravity to high precision. been met yet? Met	16/17 (94.1%) students turned in the assignment with an average score of 97.5%. One student did not turn in the assignment. Overall, the performance on the lab was exceptional and students tried very hard to achieve the lab objectives. One student group was able to achieve 0.0001% accuracy --100x greater than the requirement.		

PHY 213				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
Direct - Class Assignment	Has the criterion At least 90% of students will achieve >90% on "Lab 4 - Mirrors" where students are asked to come up with their own experiment to measure the focal length of	11/12 (91.2%) students completed Lab 4 with an average grade of 92%. One student did not complete the lab. Due to snow related weather events, the original lab had to be reworked to accommodate for the loss of time. Hopefully in future		

	a large mirror. Been met yet? Met	semesters this will not be an issue.		

Standard/Outcome

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

Assessment Measures

PHY 315				
Assessment Measure	**Criterion**	**Summary**	**Attachments of the Assessments**	**Improvement Narratives**
Direct - Class Assignment	Has the criterion All students will achieve a homework score >85% on all homework assignments. been met yet? Met	Student average on all homework assignments was 91.8%		

Analysis of the Assessment Process

Describe your assessment process; clearly articulate how the program uses coursework and or Student Performance Review for program wide assessment. Note any changes that occurred to the process since the previous year. Discuss what activities were successful 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.

Transitioning from major to minor was the most significant change and along with the change came a change in the assessment map. Most assessments come from student coursework and their grades on exams, homework's, and labs. I do not see any need for further change at this time since this is a standalone minor.

The one objective not met was the overall homework grade for PHY 201. I am currently working to revise homework assignments in the coming semester to better meet the needs of my students. Changes will include transition problems between mastering basic concepts so they can be applied in more difficult problems afterwards.

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 201
Assessment Measure	Direct - Class Assignment
Assessment Findings	Not met
Improvement Narrative	

Improvement Type	**Summary**

	Curriculum Revision	A revision of homework problems to include simpler problems to train students on the concepts before tackling the more difficult problems. Emphasis on the importance of homework in their overall performance on quizzes/exams could alleviate some instances of students not turning in homework assignments.

Program Activities

Student Performance Review
Describe the department Student Performance Review activities if not already articulated. Please describe the nature of the assessments conducted as well as the process of assessment happening 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?

During student performance review (Spring 2022) my one physics major illustrated the optical phenomena behind Schlieren Imaging and constructed a Schlieren imaging system. Using the system he built, he was able to identify infinitesimal changes in refractive index of air for a series of experiments: heat rising from a candle, human breath, and alcohol vapors.

My student was assessed on his ability to explain the optics behind the system as well as his ability to construct one from his working knowledge of the components.

Student Performance Review Schedule
Upload the program schedule for students during Performance Reviews.

Senior Showcase/Symposium
Describe program activities used to highlight Senior achievement. What benefit does the program gain from the activities? What if any assessment of students happens during this event?

N/A

Tools used for Assessment
Upload rubrics or other Assessment based tools used by the program that are important to the assessment process.

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?

N/A

Co-Curricular and LEAD Events
Describe Co-Curricular and LEAD events sponsored by program faculty. This includes LEAD and other events meant to engage students and foster learning outside of the classroom.

N/A

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 accomplishment a student achieved outside of course work or the normal expectation of student success.

N/A

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

N/A

Faculty Accomplishments
Highlight special examples of faculty success in the profession/field/content area. This is for any accomplishment of a faculty member that is research or professional in nature.

N/A

Appendix

Annual Assessment Rubric 2022 — 29.000 pts 60.42%

Clear	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 Student Demographics, Retention, and Degree Completion Data weight: 1.000	The program provides a detailed description on the enrollment, retention, persistence and degree completion 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 enrollment, retention, persistence, and degree completion data provided.	The program does not reflect on enrollment, retention, persistence, and degree completion data in a detailed way.	N/A
Comment:				
Marketing Materials weight: 1.000	The program outlines the successes and needs in regards to marketing. Detailed suggestions on how to market the program and what niche areas that are program specific would benefit the marketing strategy.	✓ The program discussed the general marketing strategy for the program.	The program provided little to no discussion on the marketing materials or approach to how to market the program.	N/A
Comment:	there are no marketing materials for the minor			
Alignment to University Objectives weight: 1.000	The program provides a detailed explanation of how program courses align to the Institutional Objectives. This explanation details specific courses, or activities that coordinate with the intent of the Institutional Objectives.	✓ The program provides a basic explanation of how program courses align to the Institutional Objectives. This explanation provides a minimal understanding of how the program is aligned to the Institutional Objectives.	The program provides little to no explanation of how program courses align to the Institutional Objectives.	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:				
NSSE Objectives weight: 1.000	The program provided a detailed listing of activities and assessments used within the program that focused on the identified NSSE objectives. The activities and assessments were divided out within the curriculum and impacted different cohort groups.	✓ The program provided a basic explanation of the activities and assessments used within the program that focused on the identified NSSE objectives.	The program provided minimal explanation of the activities and assessments used within the program that focused on the identified NSSE objectives.	N/A
Comment:				
Curriculum Map alignment and changes weight: 1.000	The curriculum map is detailed and complete. All Changs made to the curriculum map are detailed with supporting rationale for the decision..	✓ The curriculum map is complete. Changes made to the curriculum map are explained with some explanation as to why the changes were implemented.	The curriculum map is not complete and little to no explanation on curricular changes was provided.	N/A
Comment:	a description of the curriculum explains how remaining majors will be taught out.			
Assessment Map 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:	changes in assessment are briefly discussed and clarified.			

Data Driven Decision-making is explained weight: 1.000	An overview of program assessment is provided with details on the specific successes and challenges from the year. A detailed review of how assessment was administered over the academic year is clearly outlined.	✓ A basic overview of program assessment is provided with some details on the successes and challenges from the year. A basic review of how assessment was administered over the academic year is outlined.	A basic overview of program assessment is not provided with little to no discussion on the administration of assessment over the academic year.	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:	strong summaries were provided on assessments but no supporting data was uploaded.			
Analysis of Assessment 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:	Program is a minor so not expected to participate.			
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:	Program is a minor so not expected to participate.			
Co Curricular and LEAD 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:				