



## Program Assessment Report (PAR)

### Physics & Math Dual (PHYM) Baccalaureate Degree

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**ACADEMIC YEAR COVERED BY THIS REPORT:** 2021-2022

#### I. PROGRAM LEARNING OUTCOMES

Note This degree program is, in regard to physics content, identical to the traditional B.S. Physics degree. The Physics and Math Dual B.S. degree is available to students who seek to take additional mathematics courses beyond the already significant number of math courses already required by the B.S. degree. As the required physics content for both the Dual and B.S. degrees are the same, the learning outcomes are the same for both programs and assessment has historically assessed together. Graduates will be able to

- Apply and integrate sound knowledge of several core areas of physics including mechanics, modern physics, electricity and magnetism, statistical mechanics, optics, instrumentation, and quantum mechanics (Outcome 1).
- Understand and conduct research in physics at a level appropriate to an undergraduate major (Outcome 2).
- Analyze and communicate research results effectively in multiple oral and written representations (Outcome 3).

#### II. PROCEDURES USED FOR ASSESSMENT

##### A. Direct Assessment

Direct measures that will be used to assess\* each learning outcome a. The oral presentation of the student's mandatory senior research project (PHY 4940) will measure all three outcomes with data solicited from faculty members attending the student's presentation. In particular, these faculty will be asked how well the student met each of the three outcomes above, with possible answers very well, fairly well, not well, and cannot judge, with comments to accompany each response. b. Data solicited from faculty who mentor and teach the senior research project required of all seniors, PHY 4940, with the same questions as described above measuring Outcome 1 and Outcome 2. The student's written report and oral presentation on the project will be measures of Outcome 3. c. Data solicited from faculty teaching selected advanced undergraduate courses with the same questions listed in the first item above measuring Outcome 1. \*The American

Physical Society (APS) is currently finalizing the Effective Practices for Physics Programs (EP3) Project. EP3 will provide a guide for self-assessment of undergraduate physics programs founded on documented best practices linked to measurable outcomes. The American Physical Society (APS) is a nonprofit membership organization working to advance and diffuse the knowledge of physics through its outstanding research journals, scientific meetings, and education, outreach, advocacy, and international activities. The WSU Physics Department is committed to developing and utilizing an assessment approach that is viewed as the gold standard, as outlined in the EP3 guide, as regarded by the national physics community.

## **B. Scoring of Student Work**

Both quantitative and qualitative assessment of senior project (PHY 4940) oral presentations and final written reports is accomplished with a scoring rubric. This rubric is attached as a supporting document. Regarding the assessment procedure for direct measure (a), the rubric does not line up exactly with the learning outcomes. To make them line up, Outcome 1 will be evaluated by scores on the "Content" row of the rubric. Outcome 2 will be evaluated by the rows "Organization" and "Questions". Outcome 3 will be evaluated by the row "Language Use". Regarding the assessment procedure for direct measure (a), the surveys were summarized by assigning the following scores for each outcome: exceeds standard = 4 meets standard = 3 nearly meets standard = 2 does not meet standard = 1 The scores for each measure for each student were averaged over faculty responses. Then the average score for each measure for each student was averaged over the number of students to obtain a departmental average score for each measure. Regarding the assessment procedure for direct measure (b), the rubric rows for "Senior Thesis Write-Up" do not match up directly with stated learning outcomes. Therefore the following connections were used: Outcome 1: "Experimental Methods" plus "Results and Discussion" Outcome 2: "Introduction" and "Conclusion/Summary" Outcome 3: All other rubric rows dealing with language and report format.

## **C. Indirect Assessment**

Exit interviews with recent graduates will be used to measure all three outcomes. Every third year an alumni survey will be conducted. Assessment of the program will also be accomplished indirectly via tracking outcomes of the current academic year's graduating seniors in regard to career trajectories.

## **III. ASSESSMENT RESULTS/INFORMATION:**

1. Direct Assessment (a) 2. Direct Assessment (b) 3. Direct Assessment (c) 4. Indirect Assessment

1 student graduated from this program in 2021-2022 1. Outcome 1: 4, exceeded standard. Outcome 2: 4, exceeded standard. Outcome 3: 3.87, exceeded standard. The student in this program exceeded standards for each outcome. 2. Outcome 1: 30/30 Outcome 2: 25/25 Outcome 3: 45/45 A specific standard for meeting expectation has not been defined for this rubric, but this student performed very well. 3. Procedure not performed. 4. The student was admitted and enrolled to a Ph.D program, with a goal of doing research on the interaction between quantum mechanics and biology.

1. None 2. None

#### **IV. ACTIONS TO IMPROVE STUDENT LEARNING**

These results were shared at a faculty department meeting. A more extensive assessment plan is under development. In addition to the assessment procedure described above, the new plan will involve administration of standard, national assessment tools in most core physics classes so that comparison from year to year as well as comparison to national norms can be evaluated. In addition a procedure to ensure that written learning objectives are communicated to the students for each course will be put in place. General plan: The Physics Department Undergraduate Studies Committee (USC) will gather, analyze and summarize all assessment data and information. Based on its findings, recommendations for improvements in meeting objectives and learning outcomes will be made by the USC and communicated to the entire faculty. Results from the prior academic year will be presented to the department in the subsequent fall annually. Every three years, an alumni survey will be conducted. Based on the outcome assessments and the alumni survey, a summary of recommendations will be compiled every three years.

#### **V. SUPPORTING DOCUMENTS**

Additional documentation, when provided, is stored in the internal Academic Program Assessment of Student Learning SharePoint site.