
**Physics, BS (PHY) Baccalaureate Degree**

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

## I. PROGRAM LEARNING OUTCOMES

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. It had been expected that the

EP3 guide would have been available by now, but its release was delayed and is now scheduled for early 2021. The Wright State University Department of Physics has delayed making any significant modifications to its assessment design and implementation until access to EP3 is possible. 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.

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

1. 4 students were evaluated using this procedure Outcome 1: 2.98, lowest score 1.67, highest score 4. 2 students met standard. Outcome 2: 3.04, lowest score 1.92, highest score 3.67. 3 students met standard. Outcome 3: 3.92, lowest score 3.67, highest score 4. 4 students met standard. The highest category was Outcome 3, communication – eye contact, speaks clearly, engages audience. Regarding

Outcome 1, two of the four students scored below a 3.0 average. The department views this as an area that needs work, since an understanding of the underlying physics content is crucial to the discipline of physics. 2. This assessment procedure was not performed. 3. This assessment procedure was not performed. 4. During the 2021-22 academic year, 4 students completed the B.S. degree in Physics at WSU. Three of them are currently in Ph.D. programs in physics or physics-related fields, and the fourth is working locally for a technical company.

1. None 2. The WSU Physics B.S. program prepares and positions its graduates for post-college success in regard to additional academic pursuits and/or career placement. Confidence in the department's graduates by outside employers and other universities is an indirect indication of the students' knowledge of physics and their ability to apply that knowledge.

## IV. ACTIONS TO IMPROVE STUDENT LEARNING

These results were shared with faculty at a departmental meeting. One result of the discussion was to improve our assessment tools. Therefore, 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.