



## Physics (B.S.)

Department Website: <http://www.american.edu/cas/physics/BS-PHYS.cfm>

### 1. Learning Outcomes

- A) Students will be able to demonstrate their understanding of the foundations in physics (classical mechanics, computational physics, electricity and magnetism, modern physics, waves and optics, and quantum mechanics) by demonstrating competence in the major through appropriate homework assignments and examinations, particularly in their upper-level physics courses. Homework assignments within this learning outcome refer specifically to more traditional forms of mathematical and problem solving activities common to all physics classes.
- B) Students will be able to competently solve appropriate problems in upper level physics courses using increasingly important computational and mathematical tools, such as Mathematica. Specific courses include; Phys 365 (Waves and Optics), Phys 430 (Classical Mechanics), Phys 450 (Electricity and Magnetism), and Physics 470 (Introduction to Quantum Mechanics).
- C) Students will be able to demonstrate competency in experimental design and scientific data collection and analysis.
- D) Students will be able to demonstrate competency in their understanding of scientific information, both orally and in writing.
- E) Upon taking the foundational courses in physics (classical mechanics, computational physics, electricity and magnetism, modern physics, waves and optics, and quantum mechanics) students will be able to integrate competently

the knowledge and skills acquired in the major and have adequate preparation to succeed in post-undergraduate studies or a professional career.

## 2. Assessment Plan

Measures	Target	Learning Outcomes	Cycle and Reviewers
<p>Measure 1 (Direct)</p> <ul style="list-style-type: none"> <li>Samples of student work (including homework, exams, papers, and/or projects) from selected 300-level and above physics courses obtained from student portfolios.</li> </ul>	<ul style="list-style-type: none"> <li>Scores on faculty-developed rubrics for final exam, papers, and/or projects.</li> <li>Chronological grade distribution of homework scores (i.e. do individual student's homework scores show improvement from semester to semester?)</li> </ul>	A, B, C, D, E	<ul style="list-style-type: none"> <li>Data collected each semester a given course is offered.</li> <li>Data is reviewed annually by a committee consisting of at least 50% of the physics faculty.</li> </ul>
<p>Measure 2 (Indirect)</p> <ul style="list-style-type: none"> <li>Email departmental survey of graduating seniors and recent alumni.</li> </ul>	<ul style="list-style-type: none"> <li>Surveys reveal a positive response from a majority of respondents.</li> </ul>	E	<ul style="list-style-type: none"> <li>Email surveys sent on an annual basis.</li> <li>Survey summaries are reviewed annually by all physics faculty.</li> </ul>
<p>Measure 3 (Indirect)</p> <ul style="list-style-type: none"> <li>Telephone interviews with students in graduate school.</li> </ul>	<ul style="list-style-type: none"> <li>Interviews reveal a positive majority response.</li> </ul>	E	<ul style="list-style-type: none"> <li>Telephone interviews conducted on an annual basis.</li> <li>Interview summaries are reviewed annually by all physics faculty.</li> </ul>

Measures	Target	Learning Outcomes	Cycle and Reviewers
Measure 4 (Direct) <ul style="list-style-type: none"> <li>Review of students' written research papers and oral presentations in Senior Capstone Seminar course.</li> </ul>	<ul style="list-style-type: none"> <li>Scores on faculty-developed rubric for research paper.</li> <li>Scores on faculty-developed rubric for oral presentation.</li> </ul>	A, D	<ul style="list-style-type: none"> <li>Data reviewed on a bi-annual basis.</li> <li>Rubric analysis conducted by a minimum of two physics faculty members.</li> </ul>
Measure 5 (Direct) <ul style="list-style-type: none"> <li>Review of students' written laboratory work and oral presentations in Experimental Physics (Phys 440).</li> </ul>	<ul style="list-style-type: none"> <li>Scores on faculty-developed rubric for written laboratory report.</li> <li>Scores on faculty-developed rubric for oral presentation.</li> </ul>	A, C, D	<ul style="list-style-type: none"> <li>Data reviewed on a bi-annual basis.</li> <li>Rubric analysis conducted by a minimum of two physics faculty members.</li> </ul>
Measure 6 (Indirect) <ul style="list-style-type: none"> <li>End of semester student knowledge/communication skills survey in selected upper-level physics classes.</li> </ul>	<ul style="list-style-type: none"> <li>Surveys reveal a positive response from a majority of student respondents.</li> </ul>	A, B, C, D (depending on course)	<ul style="list-style-type: none"> <li>Data reviewed semi-annually by all physics faculty.</li> </ul>
Measure 7 (Direct) <ul style="list-style-type: none"> <li>Conceptual Assessment surveys in selected upper-level physics classes</li> </ul>	<ul style="list-style-type: none"> <li>Students show comparable or better success than the expected success from the papers</li> </ul>	A	<ul style="list-style-type: none"> <li>Data collected each semester a given course is offered</li> <li>Data is reviewed bi-annually by a committee consisting</li> </ul>

Measures	Target	Learning Outcomes	Cycle and Reviewers
			of at least 50% of the physics faculty
Measure 8 (Indirect) <ul style="list-style-type: none"> <li>• Obtain data on national standardized physics subject tests that our students take</li> </ul>	<ul style="list-style-type: none"> <li>• Students score in the 75% percentile or higher nationally</li> </ul>	A,B,E	<ul style="list-style-type: none"> <li>• Data will be collected semi-annually and reviewed during a faculty meeting where at least 75% of the faculty is present</li> </ul>