

Department of Physics and Astronomy Program Goals and Outcomes

Program Goals

Upon completion of the Bachelor of Science degree in Physics, graduates will be able to:

- **LEARNING GOAL 1.**

Demonstrate proficiency in the basic subfields of physics (classical mechanics, electromagnetism, quantum mechanics, statistical mechanics, and thermodynamics) as well as areas of application (e.g., solid state physics, astrophysics, etc).

- **LEARNING GOAL 2.**

Apply physical principles to novel situations, both in the classroom and in research settings, through critical thinking, problem solving, mathematical and computer modeling, and laboratory experimentation.

- **LEARNING GOAL 3.**

Construct and assemble experimental apparatuses, conduct and analyze measurements of physical phenomena, and make meaningful comparisons between experiment and theory.

PHYSICS PROGRAM LEARNING OUTCOMES

Upon completion of the Bachelor of Science degree in Physics, graduates will be able to:

1.
 - LEARNING OUTCOME 1 (a).
Demonstrate mastery of the core concepts and general principles of physics.
 - LEARNING OUTCOME 1 (b).
Demonstrate competent knowledge of the specific concepts, principles, and problems of each of the basic subfields and some areas of application in physics.
2.
 - LEARNING OUTCOME 2 (a).
Formulate, solve, and interpret problems by the use of physical principles, via mathematical and computational techniques.
 - LEARNING OUTCOME 2 (b).
Describe and discuss the formulation, solution, and interpretation of a problem, by the use of physical principles, via a seminar presentation.
3.
 - LEARNING OUTCOME 3 (a).
Conduct experiments with the proper use of equipment for a detailed comparison with physical models and theories.
 - LEARNING OUTCOME 3 (b).
Examine the results of experiments with the statistical methods of error analysis, including the assessment of experimental uncertainties.

Note: Consistent with the Program Learning Goals of Section 1, one could logically add a third outcome for Learning Goal 2, along the lines of: "Formulate, solve, and interpret problems by the use of physical principles, via experimental techniques." However, this is implicit in the Learning Outcomes 3 (a) and 3 (b) associated with Learning Goal 3, dealing with experimentation; thus, to avoid redundancy, this possible outcome is omitted.

ASSESSMENT METHODS

The Physics & Astronomy Department will use direct (objective) measures for the evaluation of all Program Learning Outcomes and Rubrics described in Sections 2 and 3.2, according to the scheme summarized below. The direct measures to be used are different forms of course-embedded assessment: embedded questions and problems, laboratory reports, and seminar presentation outlines.

1.
 - **ASSESSMENT MEASURE 1 (a).**
Embedded questions or problems, in midterms and/or final exams, involving core concepts and general principles of physics.
 - **ASSESSMENT MEASURE 1 (b).**
Embedded questions or problems, in midterms and/or final exams, involving specific knowledge of basic subfields and application areas.
2.
 - **ASSESSMENT MEASURE 2 (a).**
Embedded problems, in midterms and/or final exams, to be solved by mathematical and computational techniques.
 - **ASSESSMENT MEASURE 2 (b).**
Representative sample of student seminars in electronic format.
3.
 - **ASSESSMENT MEASURE 3 (a).**
Representative sample of laboratory reports addressing the comparison of experiments with physical models and theories.
 - **ASSESSMENT MEASURE 3 (b).**
Representative sample of laboratory reports addressing the application of error analysis in specific experiments.

PHYSICS PROGRAM ASSESSMENT TIME FRAME

For the three-year cycle 2008-2011, the following time frame is planned. Given three major program learning goals, the corresponding outcomes are evaluated according to the rule: one goal per academic year. The selection of specific goals for every year is dictated by curricular offerings.

- **ACADEMIC YEAR 2008-2009.**

The Learning Outcomes 2 (a) & 2 (b) will be evaluated via the following courses:
PHYS 210, PHYS 350, and PHYS 371 (offered in the Spring 2009).

- **ACADEMIC YEAR 2009-2010.**

The Learning Outcomes 1 (a) & 1 (b) will be evaluated via the following courses:
PHYS 110, PHYS 210, PHYS 240, PHYS 310, and PHYS 320.

- **ACADEMIC YEAR 2010-2011.**

The Learning Outcomes 3 (a) & 3 (b) will be evaluated via the following courses:
PHYS 110, PHYS 210, and PHYS 341 (or equivalent).

PHYSICS PROGRAM ASSESSMENT IMPLEMENTATION

The Physics Program Assessment will be implemented according to the following generic guidelines:

- **Who Will Conduct the Assessment?**

The assessment will be conducted by the Physics & Astronomy Department Chair in coordination with the instructors involved with the relevant courses. Representative forms of course-embedded assessment (questions, problems, reports, etc) will be prepared by the instructor and final decision will be made in a consultative manner. Whenever needed or deemed appropriate, a coordinator other than the Physics Chair may be appointed to further provide support through the assessment process.

- **Assessment Follow-Up.**

The Physics & Astronomy Department will meet once a year, at the conclusion of the annual assessment, to discuss findings and provide recommendations for improvement of the major curriculum.