**Annual Departmental Assessment Report**

**Department or Program: Physics**

**Academic Year of Report: 2018**

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**Section 1: Learning Objectives Assessed for this Report**

Desired broad outcomes for UO physics baccalaureate recipients include:

1. Knowledge of principles and concepts for specific core subject areas listed below.
2. Ability to apply principles and concepts to analyze problems within specific core areas.
3. Capability with quantitative methods appropriate for the core areas.
4. Ability to analyze and interpret quantitative results.
5. Experience with integration of concepts: analysis of complex problems cutting across multiple core areas.
6. Ability to collect and appropriately analyze data working independently and in collaboration with others (experimentation; data collection, reduction and analysis; model-based computation including simulations and inversion of observations; and literature research using basic and state-of-the-art technology).
7. Ability to communicate orally and in writing by making appropriate use of current presentation technology.
8. Familiarity with current developments in physics.

To achieve these outcomes, the undergraduate major curriculum requires coursework with nationally-standard coverage of the core subject areas. As specific content objectives for the core areas, students who complete the department-based courses should:

1. have a working knowledge of classical mechanics and its application to "standard" problems such as central forces and rotational dynamics;
2. understand the principles of special relativity and have a working knowledge of its application to the mechanics of particles;
3. have a working knowledge of basic electrostatics, electrodynamics, and magnetism leading to the development of Maxwell's equations;
4. have a working knowledge of geometrical and physical optics;
5. have a working knowledge of electrical circuits and their applications;
6. have a working knowledge of basic thermodynamic principles and the relation of statistical mechanics to them;
7. have a working knowledge of elementary quantum mechanics and its application to the explanation of atomic structure and atomic spectroscopy;
8. have basic skills in laboratory practice including a working knowledge of data analysis, computer interfacing, scientific computing, and graphical presentation of results.

At present the major is organized into three tracks to graduation:

1. The standard physics option, which is intended to prepare students for graduate school in physics or a related discipline, and which combines advanced lecture and laboratory courses.
2. The applied physics option, which is intended to prepare students for careers in industrial research and development, and which combines some lecture courses with a heavier load of laboratory courses.
3. The general physics option, which is designed for training middle-school and high-school teachers, and which will combine some physics classes with classes in other science departments and optionally the UO School of Education

**Section 2:  Assessment Activities**

We chose to examine the efficacy of the track-based path through the major.  Through this analysis we discovered that this system was unnecessarily rigid and led to potential poor learning outcomes.  For some students this track system led to an inability to take all of the desired physics electives as they were seen as “accessory” or otherwise external to the core path to graduation.  Further, some classes, for example, biophysics, do not neatly fit themselves into the three specified tracks.  As a result, the enrollment in these courses, which otherwise would have attracted broad interest, was artificially depressed.  Finally, it was determined that this track system did not provide sufficient flexibility to allow students to build a path through the major that best suited them and their goals.

**Section 3:  Actions Taken Based on Assessment Analysis**

The primary response to this analysis has been a re-evaluation of our track system and has initiated the process to replace it with a set of suggested paths through the major.  This will include paths such as “graduate school”, “physics education”, “data science”, “industrial research”.  These paths will offer an outline for a student’s physics career that can be modified in consultation with the undergraduate advisor to provide a tailored education for each physics major.

**Section 4:  Other Efforts to Improve the Student Educational Experience**

The department has been continually revising and improving our efforts to teach science literacy to non-majors, in concert with the Science Literacy Program, focusing on evidence based practices that promote assessment, inclusion, and active learning.  In addition, the department has been revising and updating the laboratory courses and beginning to put together a data science path through the major.

**Section 5:  Plans for Next Year**

Over the course of the coming year the Physics curriculum committee will assess the functionality of the core introductory curriculum presented in the Physics 25X and 35X sequences.  The goal of this assessment will be a reorganization of the curriculum in order to bring students more rapidly to the point at which they can begin to take the courses described above as central to the Physics major.  A secondary goal will be to reorganize the curriculum to make more aggressive use of computational and data sciences approaches, which are rapidly becoming as important to the study of Physics as mathematical knowledge.