UNIVERSITY OF SAN FRANCISCO | College of Arts and Sciences

ASSESSMENT REPORT
FOR ACADEMIC YEAR 2018-2019

ENGINEERING PHYSICS MINOR

Department of Physics & Astronomy

University of San Francisco

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1 LOGISTICS, MISSION STATEMENT & PROGRAM LEARNING OUTCOMES

1.1 PHYSICS & ASTRONOMY CONTACT PERSON (FACULTY ASSESSMENT COORDINATOR).

Name: Professor Horacio E. Camblong, Email: camblongh@usfca.edu

1.2 PHYSICS & ASTRONOMY DEPARTMENT MISSION STATEMENT

No changes were made to the program mission statement since the last assessment cycle in October 2018.

> The mission of the Physics & Astronomy Department is to provide our students with the fundamental knowledge and the practical tools of a rigorous physics education that will help them be players and leaders in shaping a more humane world. The Physics program is implemented via a comprehensive coverage of experimental, theoretical, and computational physics, and by combining coursework together with on- and off-campus research and exposure to cutting-edge equipment and laboratory techniques. This rigorous training prepares students for careers and/or graduate studies in any discipline within fundamental or applied science (physics, astronomy, mathematics, chemistry, biology, etc); in any of the standard engineering fields; in education; in medicine and related disciplines; and many other fields, such as law, financial analysis, or positions in the high-technology sector of the global economy.

1.3 ENGINEERING PHYSICS MINOR LEARNING OUTCOMES (PLOs)

No changes were made to the program learning outcomes (PLOs) since the last assessment cycle in October 2018.

1. - **PLO 1 (a).**
   Demonstrate competent knowledge of the core concepts, principles, and applications of *electronics*.
   - **PLO 1 (b).**
   Demonstrate competent knowledge of the core concepts, principles, and applications of *computational physics*.

2. • **PLO 2.**

   Conduct experiments for a comparison with physical models and theories, and *examine* the results with the statistical methods of error analysis.

1.4 CURRICULAR MAP LINKING THE ENGINEERING PHYSICS MINOR LEARNING OUTCOMES AND THE RELEVANT PHYSICS COURSES

In the curricular map below, PLO stands for "Program Learning Outcome" with the corresponding enumeration [i.e., 1 (a), 1 (b), etc] The check-mark symbol ✓ is used to indicate the applicable Program Learning Outcomes for each required course.

PLOs ⟹ **PHYS courses** ⇓	**PLO 1 (a)** **Demonstrate** knowledge/applications electronics	**PLO 1 (b)** **Demonstrate** knowledge computational physics	**PLO 2** **Conduct and examine** experiments + error analysis
PHYS 110	✓	✓	✓
PHYS 210	✓	✓	✓
PHYS 261	✓	✓	✓
PHYS 262	✓	✓	✓
PHYS 301	✓	✓	✓
PHYS 302	✓	✓	✓

1.5 PROGRAM LEARNING OUTCOME(S) ASSESSED FOR THE ACADEMIC YEAR 2018-2019

The Program Learning Outcome assessed for this one-year period involves one of three major learning goals relevant to physics and astronomy: proficiency in the basic subfields of physics and astronomy, as well as areas of application.

- **PLO 1 (a).**

  Demonstrate competent knowledge of the core concepts, principles, and applications of *electronics*.

2 METHODOLOGY

Assessment activities in the Engineering Physics Minor program were undertaken as planned during the AY 2018-2019, following multiyear departmental guidelines.

2.1 Generic Assessment Procedures.

The program learning outcome above was assessed in the following courses: PHYS 262 (Digital Electronics). The whole process was organized at the departmental level with cooperation of all the instructors involved and our Program Assistant, and according to our multiyear departmental guidelines. The data were stored electronically. The faculty member teaching the relevant course was responsible for the required data collection: Thomas Bottger (PHYS 262). In addition, the team work was coordinated by Horacio Camblong.

2.2 Assessment Procedures and Data Analysis.

The relevant learning outcome was assessed through a sequence of questions from the final exam, which were evaluated by a number of direct measures. These involved testing knowledge of the basics of digital electronics and the demonstrated ability to solve related problems.

The learning outcomes were gauged with a ternary metric system: above average, average (benchmark standard), and below average. It should be noticed that these are meant to be categories defined by comparison with the benchmark standard, regardless of the statistical course average for any given class section. This classification refers to the level of mastery of the skill and knowledge set involved in the learning outcome. "Average" is meant to represent a benchmark standard set up to correspond to an overall mastery of the outcome (involving most parts of the assessed problem or question), but allowing for errors or omissions whose correction would otherwise lead to considerable performance improvement. The "above average" mark reflects almost complete command of the relevant skill and knowledge set. The "below average" mark does not necessarily imply failure to perform on the given

outcome, but reflects incomplete mastery of the relevant skill and knowledge set, leading to significant gaps in understanding and/or problem-solving outcomes.

3 RESULTS & MAJOR FINDINGS

The results for the courses selected for assessment are summarized below:

- PHYS 262 (Digital Electronics), Spring 2019: A sequence of questions and problems from the final exam were selected and graded, for a total of 10 students. The selected questions covered the basics of digital electronics and the demonstrated ability to solve related problems.

  Number of Students: 10;
  Above Average: 10 students (100%); Average: 0 students (0%); Below Average: 0 students (0%).

4 CLOSING THE LOOP

4.1 Follow-Up Discussion and Decision-Making.

Two Physics & Astronomy faculty meetings addressed various aspects of assessment (February 7th and October 2nd, 2019). The discussions included a review of our official assessment plan, the learning outcomes, and the results of this assessment cycle. In addition, follow-up discussions are planned for the ongoing 2019-20 Physics Department meetings.

The following conclusions were drawn:

- All in all, the results of the assessment activities show a very high level of performance by all students, with an excellent command of the electronics skills relevant for the engineering-physics-minor PLO 1 (a).

- The assessment outcomes of this cycle are also consistent (qualitatively and quantitatively) with the assessment outcomes of earlier academic years.

- In our departmental discussions of assessment activities and plans, we have often addressed targeted curricular questions that we consider central to the goals of our major and minor programs. One question relevant to this specific report has been:

– Are physics majors proficient in problem-solving techniques for "complex problems" (involving multi-step tasks)?

This is equally relevant for the engineering physics minor, and the types of projects it involves. From the assessment of this learning outcome, we found that students are learning the basic tools to solve a variety of problems over a broad range of physics fields, and with all degrees of complexity.

- The External Program of the Academic Program Review conducted in Spring 2018 praised our assessment program as follows.

  > "The overall P&A assessment program is well designed and appears mature. The probes are robust and appropriate, and the reports provided by the department are easy to interpret and contain useful information about student performance. P&A does very good work in many areas and students are a dominant focus in much of that work. ... The assessment program for P&A is more than sufficient, and it is managed extremely well."

  This is consistent with our own self-evaluation.

- No significant curricular changes are planned/required for AY 2019-20.