UNIVERSITY OF SAN FRANCISCO | College of Arts and Sciences

ASSESSMENT REPORT
FOR ACADEMIC YEAR 2017-2018

ENGINEERING PHYSICS MINOR

Department of Physics & Astronomy

University of San Francisco

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Submitted by Prof. Horacio E. Camblong

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1 LOGISTICS & 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 2017.

> 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 2017.

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 PROGRAM LEARNING OUTCOME(S) ASSESSED FOR THE ACADEMIC YEAR 2017-2018

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 (b).**

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

2 METHODOLOGY

2.1 Methodology.

Assessment activities in the Engineering Physics Minor program were undertaken as planned during the AY 2017-2018, following multiyear departmental guidelines.

2.1.1 Generic Assessment Procedures.

The program learning outcome above was assessed in the following courses: PHYS 301 (Computational Physics). The whole process was organized at the departmental level with cooperation of all the instructors involved, 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: Xiaosheng Huang (PHYS 301). In addition, the team work was coordinated by Horacio Camblong.

3 Assessment Procedures and Data Analysis.

The relevant learning outcome was assessed through a final computational project that was evaluated by a number of direct measures. These involved functionality of the program

(80%, including performance of the basic functions and pattern recognition) and efficiency and software carpentry (20%).

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.

4 RESULTS & MAJOR FINDINGS

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

- PHYS 301 (Computational Physics), Spring 2018: The problem used for the final project was graded, for a total of 25 students. The selected problem is a computational physics project involving face detection and recognition.

  Number of Students: 25;
  Above Average: 24 students (96%); Average: 1 student (4%); Below Average: 0 students (0%).

5 CLOSING THE LOOP

5.1 Follow-Up Discussion and Decision-Making.

Two Physics & Astronomy faculty meetings addressed various aspects of assessment (February 6th and September 26th, 2018). 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 2018-19 Physics Department meetings.

The following conclusions were drawn:

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

- In the latest 3-Year Assessment Plan (2015–2018), targeted curricular questions were proposed for each year of this 3-year cycle. We specifically addressed the question:

  – 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 2018-19.