

**ASSESSMENT REPORT
FOR ACADEMIC YEAR 2020-2021**

ASTRONOMY 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).

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1.2 PHYSICS & ASTRONOMY DEPARTMENT MISSION STATEMENT

No changes were made to the program mission statement since the last assessment cycle in December 2020.

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 ASTRONOMY MINOR LEARNING OUTCOMES (PLOs)

No changes were made to the program learning outcomes (PLOs) since the last assessment cycle in December 2020.

1. • PLO 1.

Demonstrate mastery of the core concepts and general principles of astronomy.

2. • PLO 2.

Conduct experiments and observations with the proper use of equipment

for a detailed comparison with physical and astronomical models and theories.

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

In the curricular map below, the check-mark symbol ✓ indicates the applicable PLOs for each course.

PLOs ⇒ PHYS courses ↓	PLO 1 Demonstrate concepts/general principles of astronomy	PLO 2 Conduct experiments/observations with phys/astro equipment
PHYS 120 (Astronomy: Earth/Cosmos)	✓	✓
PHYS 121 (Planetary Astronomy)	✓	✓
PHYS 122 (Geometry of the Cosmos)	✓	
PHYS 221 (Ancient Astronomy)	✓	
PHYS 100, 101, 110, 130 201, 210 (Physics Electives)		✓

1.5 PROGRAM LEARNING OUTCOME(S) ASSESSED FOR THE ACADEMIC YEAR 2020-2021

The Astronomy Minor Program Learning Outcome assessed for this one-year period, involves experimental procedures and analysis.

- **PLO 1.**

Demonstrate mastery of the core concepts and general principles of astronomy.

1.6 ASSESSMENT SCHEDULE

The last Academic Program Review (APR) of Physics & Astronomy was conducted in Spring 2018. For the Astronomy Minor discussed in this report, the following timetable of Program Learning Outcomes has been followed thorough last academic year:

- AY 2018-19: PLO 1
- AY 2019-20: PLO 2
- AY 2020-21: PLO 1

We anticipate reassessment of these PLOs until the next APR according to a flexible timetable that will depend on internal factors involving course offerings (as some courses are not offered every year) and ongoing departmental discussions on the assessment procedures. For this academic year, we are already collecting data for next year's report as follows:

- AY 2021-22: PLO 2

2 METHODOLOGY

2.1 Methodology.

Assessment activities in the Astronomy Minor program were undertaken as planned during the AY 2020-2021, following multiyear departmental guidelines.

2.2 Generic Assessment Procedures.

The program learning outcome PLO1 above was assessed in the lecture sections of the following two courses: PHYS 120 (Astronomy: From the Earth to the Cosmos) and PHYS 121 (Planetary Astronomy). The 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 members teaching the lecture sections of these courses were responsible for the required data collection and grading of the students' work products: Milka Nikolic (PHYS 120) and Aparna Venkatesan (PHYS 121). In addition, the overall logistics and final re-grading was conducted by Horacio Camblong, and subsequently discussed at a Physics & Astronomy Department meeting.

2.3 Assessment Procedures and Data Analysis.

The relevant learning outcome was assessed in two different ways: in PHYS 120 by means of questions in multiple-choice exams; and in PHYS 121 via a final course research project in lieu of a final exam. The comprehensive list of questions in PHYS 120 involved significant knowledge of the core concepts and principles of astronomy. The research projects in PHYS 121 involved original research or creative work plus a peer review component that relied on the knowledge of planetary astronomy gained in this course. Thus, the work products in both courses provided the essential ingredients for an effective PLO 1 assessment.

The learning outcomes were gauged with the *4-level scale system* listed below. It should be noted that these 4 levels are meant to be categories defined by comparison with the minimum benchmark standard, defined as “average,” regardless of the statistical course average for any given class section. This classification refers to the level of proficiency of the skill and knowledge set involved in the learning outcome.

- **Outstanding = Full Mastery.** This represents superior performance, with an almost complete command of the relevant skill and knowledge set.
- **Proficient = Partial Mastery.** This represents basic, solid performance that reflects a level of achievement where errors or omissions only affect the final results in a minimal way.
- **Satisfactory = Meets Expectations.** This represents performance that meets expectations as benchmark standard set up to correspond to an overall, satisfactory outcome (involving most parts of the assessed problem, question, or project), but allowing for errors or omissions whose correction would otherwise lead to considerable performance improvement (i.e., not reaching partial mastery, but showing a minimum acceptable level for most of the relevant skills).
- **Inadequate = Unsatisfactory Level.** This mark does not necessarily imply complete failure to perform on the given outcome, but involves serious gaps in understanding and/or problem-solving outcomes for the relevant skill and knowledge set.

3 RESULTS & MAJOR FINDINGS

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

- PHYS 120 (Astronomy: From the Earth to the Cosmos), Fall 2020:

A comprehensive multiple-choice final exam was administered for 50 students. All the questions/problems were graded, with the cumulative results shown below. They were selected to be representative of this course material, including the core concepts and general principles of astronomy. The emphasis of the course and the final exam is on the fundamental laws of physics, stellar properties and evolution, galaxies, and cosmology.

Number of Participants: 50 students;

Outstanding: 19 students (38.0%);

Proficient: 30 students (60.0%);

Satisfactory: 0 students (0%);

Inadequate: 1 student (2.0%).

- PHYS 121 (Planetary Astronomy), Spring 2021:

The final course project consisted of research work plus a peer review component, involving 39 students. Student work products covered a variety of topics related to planetary astronomy, including modern aspects of the properties of planetary systems and their evolution, the search for extraterrestrial life, ancestral sky traditions, and the privatization/militarization of space. These topics involve a significant understanding of the core concepts and general principles of planetary astronomy.

Number of Participants: 39 students;

Outstanding: 29 students (74.4%);

Proficient: 8 students (20.5%);

Satisfactory: 2 students (5.1%);

Inadequate: 0 students (0%).

Note on rubrics and grading: Project grades were determined as follows (out of a 100-point scale, converted from an original 20-point scale): 10 points for turning in a 1-page project outline with references; 60 points for the actual project; and 30 points for reviewing and summarizing another student's project.

4 CLOSING THE LOOP

4.1 Follow-Up Discussion and Decision-Making.

A Physics & Astronomy faculty meeting addressed various aspects of assessment. The discussions included a review of our assessment plan, the learning outcomes, and the results of this assessment cycle, as well as the feedback from our last assessment cycle. In addition, follow-up discussions are planned for the ongoing 2021-22 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 core concepts and general principles of astronomy, as relevant for the astronomy-minor PLO 1.
- The assessment outcomes of this cycle are also consistent (qualitatively and quantitatively) with the assessment outcomes of earlier academic years.
- We are using a model that has been successful in our Physics & Astronomy programs for several years. 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 2021-22. It has also been agreed that the ongoing pandemic created additional constraints and challenges that exceed the boundaries of a regular assessment plan—for now, no further adjustments are needed.