



2011-2012 Assessment Plan Report

PROGRAM ASSESSMENT REPORT AY 2011-2012

Report Date: SEPTEMBER 5, 2012
School/College: ARTS & SCIENCES
Department/Program: PHYSICS & ASTRONOMY
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1. **Overview Statement:** Assessment activities in the Physics major program were undertaken as planned during the AY 2011-2012, following the guidelines outlined in the “Program Assessment Plan.” Accordingly:
 - a. Two Physics program learning outcomes were assessed this academic year, within the scope of Learning Goal 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.
 - b. The learning outcomes above were assessed in the courses PHYS 110 (General Physics I), PHYS 210 (General Physics II), PHYS 240 (Modern Physics), PHYS 312 (Statistical & Thermal Physics), PHYS 330 (Quantum Mechanics), PHYS 340 (Optics), PHYS 350 (Physics Colloquium), and PHYS 422 (General Relativity). The whole process was organized at the departmental level with cooperation of all the instructors involved, and according to the Student Learning Assurance Plan for the three-year cycle 2011-2014. This plan provides precise procedural guidelines for data collection via embedded questions and/or multiple-choice exams, and for the evaluation of the gathered data against the assessment metrics. The data were stored electronically. The faculty members teaching these courses were responsible for the required data collection: Thomas Bottger (PHYS 340 and 312), Horacio Camblong (PHYS 330, 350, and 422), William Golightly (PHYS 210 and 240), and Aparna Venkatesan (PHYS 110).
2. **Please Answers the Following Questions for Each of the Student Outcomes Assessed:**
 - a. **What did you do?**

Following the guidelines of our Physics Assessment Plan, the learning outcomes were assessed by means of *embedded questions or equivalent direct measures*:

 - Exam-embedded questions/problems (on the final exams) were used for Learning Outcome 2 (a) in PHYS 110, PHYS 210, PHYS 240, PHYS 312, and PHYS 340. These were selected as representative, standard problems with significant mathematical content, requiring solution by mathematical and computational methods. In addition, the whole set of



2011-2012 Assessment Plan Report

multiple-choice questions on the final exams for PHYS 330 and PHYS 422 were assessed (the questions typically involve significant mathematical content and problem-solving skills, similar to the ETS Physics Major Field Test and/or GRE Physics Test).

- For PHYS 350, Learning Outcome 2 (b) was evaluated through the student seminars presented during the final class meeting.

b. What did the faculty in the department or program learn?

The learning outcomes were gauged with a *ternary metric system*: above average, average (benchmark standard), and below average---roughly equivalent to A range through B, B- through C-, and D-F range, respectively. 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. In all cases, student performance was evaluated on the basis of a representative sample of embedded questions (as described above). The results for the courses selected for assessment are summarized below:

- PHYS 110: A representative sample of embedded questions was extracted from two different problems, for 58 students. Above Average: 40 students; Average: 7 students; Below Average: 11 students.
- PHYS 210: A representative sample of embedded questions was extracted from two different problems, for 39 students. Above Average: 26 students; Average: 8 students; Below Average: 5 students.
- PHYS 240: One embedded problem, for 11 students. Above Average: 8 students; Average: 3 students; Below Average: 0 students.
- PHYS 312: One embedded problem, for 23 students. Above Average: 18 students; Average: 5 students; Below Average: 0 students.
- PHYS 330: Multiple-choice final exam, administered for 16 students. Above Average: 6 students; Average: 10 students; Below Average: 0 students.
- PHYS 340: One embedded problem, for 17 students. Above Average: 14 students; Average: 3 students; Below Average: 0 students.
- PHYS 350: Student performance was evaluated on the basis of their 8-minute seminar presentations---physics content and expository skills, for 17 students. Above Average: 15 students; Average: 2 students; Below Average: 0 students.
- PHYS 422: Multiple-choice final exam, administered for 7 students. Above Average: 4 students; Average: 6 students; Below Average: 0 students.

c. What will be done differently as a result of what was learned?

A faculty meeting on August 28th addressed the learning assurance plan and results of this assessment cycle, and a follow-up discussion is planned for another Fall 2012 Department meeting. So far, the following conclusions have been drawn, with



2011-2012 Assessment Plan Report

steps to be taken:

- All in all, the results of the assessment activities show a relatively high level of performance by most students, with an excellent command of basic analytical skills---both for lower- and upper-division level physics courses.
- *No significant curricular changes are planned/required for AY 2012-13.* Possible assessment-driven curricular changes will be discussed in subsequent meetings.
- The Department has not yet made a decision on the issue of the possible direct use of the *ETS Field Test in Physics* as an assessment tool. However, a step in this direction has been taken by exploring the role of ETS/GRE-style questions in targeted courses; this approach will continue during AY 2012-13.

3. **Attach a copy of the components of the department/program assessment plan that have been modified since its initial submission:**

- a. Program Mission
- b. Program Learning Goals
- c. Program Learning Outcomes
- d. Program Learning Rubrics aligned with outcomes
- e. Curriculum map that shows the courses that pertain to the outcome

NO CHANGES have been made this year.