Annual Assessment Report to the College 2011-12

College: **Science and Mathematics**

Department: **Physics and Astronomy**

Program: **Physics and Astronomy**

Note: Please submit report to your department chair or program coordinator, the assessment office and to the Associate Dean of your College by September 28, 2012. You may submit a separate report for each program which conducted assessment activities.

Liaison: **Henk Postma**

1. **Overview of Annual Assessment Project(s) (optional)**

1a. **Assessment Process Overview:** Provide a brief overview of the assessment plan and process this year.

To assess the program, our Juniors and Seniors take in the Fall and Spring semester respectively an exam developed by the department which covers the material of the freshman and sophomore years (juniors), and the ETS Majors comprehensive test (seniors). The assessment results are compiled annually and reported to the department and the university.

Assessment is under the oversight of the Department Assessment Coordinator, the Undergraduate Advisor and the Chair.

2. Student Learning Outcome Assessment Project: Answer questions according to the individual SLO assessed this year. If you assessed an additional SLO, report in the next chart below.

2a. Which Student Learning Outcome was measured this year?

1. Demonstrate knowledge of physical principles used to model natural phenomena.

2. Demonstrate ability to convey physical concepts with mathematical expressions, and effectively derive quantitative predictions from a model through mathematical analysis.

May 17, 2012

2b. Does this learning outcome align with one of the following University Fundamental Learning Competencies? (check any which apply)

Critical Thinking_____X_____
Oral Communication_____
Written Communication_____
Quantitative Literacy_____X_____
Information Literacy_____X_____
Other (which?)_____

2c. What direct and indirect instrument(s) were used to measure this SLO?

***Program Assessment**: Two exams cover the core basic material in the main topics in physics. Junior level exam: mechanics, electromagnetism, thermodynamics, optics, fluids. Senior exit exam: mechanics and relativity, electromagnetism, thermodynamics and optics, quantum mechanics and atomic physics, special topics.*

2d. Describe the assessment design methodology: For example, was this SLO assessed longitudinally (same students at different points) or was a cross-sectional comparison used (comparing freshmen with seniors)? If so, describe the assessment points used.

***Programs Assessment**: All junior level students and all senior level students.*

In the program assessment the evolution from the junior to the senior levels can be followed.

2e. Assessment Results & Analysis of this SLO: Provide a summary of how the evidence was analyzed and highlight important findings from collected evidence.

See attached.

Summary: *It appears that student learning has improved from 2010 to 2011, although the low number of students and the corresponding large confidence interval prevent us from asserting this with more certainty. The data needs to be collected over longer periods of time to be able to give a more statistically significant answer.*

2f. Use of Assessment Results of this SLO: Were assessment results from previous years or from this year used to make program changes in this reporting year?
Type of change:
changes to course content/topics covered_____X_____
course sequence_____
addition/deletion of courses in program_____X_____
describe other academic programmatic changes_____
student support services_____X_____
revisions to program SLOs_____
assessment instruments_____X_____
describe other assessment plan changes_____

Have any previous changes led to documented improvements in student learning? (describe)

Prompted by our previous assessment results, we made 2 changes

1) *We created a junior-level recitation session that, compressed in 4 weeks at the start of the Fall semester, should prepare students for their junior course work. In addition, the junior exam is administered at the end of the 4 week course.*
2) *We created a 'GRE' prep course for the spring, in which both graduate and undergraduate students participate. The graduate students take the course in preparation for their GRE test, while the undergraduate students take the course in preparation for the ETS field test.*

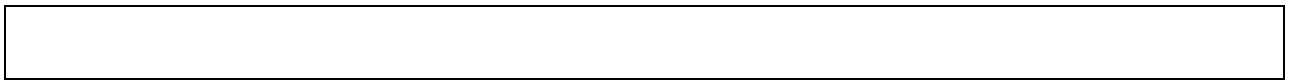
Some programs assess multiple SLOs each year. If your program assessed an additional SLO, report the process for that individual SLO below. If you need additional SLO charts, please cut & paste the empty chart as many times as needed. If you did NOT assess another SLO, skip this section.

3. **How do your assessment activities connect with your program's strategic plan and/or 5-yr assessment plan?**

The assessment activities carried out each year are planned in the department's 5 year plan. The department made a new 5 year strategic plan in Fall 2011, which included a 5 year assessment plan.

4. **Other information, assessment or reflective activities or processes not captured above.**

5. **Has someone in your program completed, submitted or published a manuscript which uses or describes assessment activities in your program? Please provide citation or discuss.**



Attachment A, ETS Field test

Background

This field test is administered to the majors at the end of their senior year, right before graduation. The test is administered in numerous institutions around the country and results are analyzed by Education Testing Service (ETS). For assessment purposes, this is the capstone exam. It is the last point in the curriculum where students subject knowledge can be assessed. The test, in combination with the junior exam, should in principle enable the department to assess educational value added.

Grading

The exam is typically not graded, as answers are gathered by ETS. For future editions of the exam, we plan to grade the students before sending the results to ETS.

The 2012 edition

In the Spring of 2012, a new course was offered with a dual purpose. First, the department wanted to offer a GRE preparation course for the Master's students. Second, the department wanted to assess undergraduate student performance at graduation time, enabling an assessment of the department's value added.

Analysis

First, we note that the number of students taking the test is relatively low, causing a relatively large confidence interval in the test scores.

We note that none of the subject areas stands out particularly, either in the positive or the negative sense.

We note that performance in the 2012 edition of the exam was better than in 2011, for all subject areas, although the increase is not statistically significant. As both editions were not graded, we tentatively attribute the increase in performance to the new GRE course offered.

Recommendation, closing the loop

In future editions, the department will grade the test before handing the answers off to ETS, and count it towards the students' grades.

ETS Field Test	Sp 2011	Sp 2012
Number of students	**9**	**6**
Assessment Indicator Title		
Classical Mechanics and Relativity	41%	49%
Electromagnetism	40%	43%
Optics/Waves and Thermodynamics	34%	46%
Quantum Mechanics and Atomic Physics	44%	49%
Special Topics	35%	38%

Attachment B, Junior Exam

Background

The junior exam is an exam created by the department that consists of 45 multiple-choice questions. The exam questions span the 6 broad subject areas listed below. The exam is typically administered in the Fall, the start of students' 3rd year. For assessment purposes, this exam is called the 'Gateway' exam. It is the best point in the curriculum to first test the majors in one cohort.

Grading

The exam scores have been counting towards the student's grades since 2010. While in 2010 and 2011 the exam was administered as part of Phys 365, the 2012 exam was administered at the end of a new course.

New course, 2012

The new course is a 4-week long recitation course that covers the 6 broad subject areas listed below. The course was developed in response to the ~50% scores of students in the previous years. The hypothesis was that a 4 week long recitation test would further strengthen the basic subject knowledge. In addition, the exam scores were expected to improve.

Analysis

The overall performance of students appears stable around the ~50% mark. We note that due to the low number of students, the confidence interval in these results is relatively large.

Surprisingly, the more intense training for the 2012 edition of the exam did not lead to significant changes in the overall student performance. We note that this is the first time the recitation course is being taught and further refinement may be needed. Student comments indicate that they felt the course did not prepare them well enough for the exam. The 2013 edition of the exam and course may therefore need to change.

Subject scores appear overall stable from 2010 to 2011. We note that the previously poor performance in Relativity was improved significantly in 2011. Overall, no specific area of the subject matter appears to be significantly better or worse than another in 2011. We note that Optics + Waves appear to be the best subjects in both 2010 and 2011.

Recommendation, closing the loop

We recommend a better alignment of the exam to the recitation session.

Semester Administered	# students	Average score
Fa 2010	9	45%
Fa 2011	6	42%
Fa 2012	9	43%

Subject Area	# of questions	2010	2011
Classical	12	46%	36%
E&M	10	34%	47%
Thermodynamics	7	52%	40%
Optics + Waves	5	67%	60%
Relativity	2	17%	42%
Quantum Mechanics	9	42%	37%