UNIT REPORT

Physics BS
Assessment Plan Summary

Physics BS

Competence For Bachelor Of Science

Goal Description:

Seniors studying Physics will demonstrate competence to graduate with a Bachelor of Science in Physics

RELATED ITEMS/ELEMENTS

RELATED ITEM LEVEL 1

Mastery Of Fundamental Principles In Physics

Learning Objective Description:

Students preparing to graduate with a BS in Physics will demonstrate comprehension of fundamental principles and the ability to apply these principles in solving problems.

RELATED ITEM LEVEL 2

Previous GRE Subject Test In Physics

Indicator Description:

Students will complete a common earlier version of the Graduate Record Subject Exam in Physics related to PHY 4370 (Classical Mechanics) under GRE standardized conditions. Faculty will have classified the questions into domains specific to the major principles in this area.

Criterion Description:

Students will score above the 50th percentile determined as a result of the graduating seniors' scores from the common exam. A raw score of 50% is in the 74th percentile for the Physics GRE with a ¼ penalty for wrong answers.

Findings Description:

At the first day of class (spring semester 2016) of physics 4370, classical mechanics, a test consisting of 17 multiple choice questions was administered. Each question had five possible responses and the students were given 30 minutes to complete the exam. The test questions were taken from the physics graduate record exam (GRE) which many physics graduate schools use as an admission criteria. The questions were filtered to only reflect the course content, i.e. classical mechanics. As well as being a useful assessment tool, by giving the physics GRE, the students gain valuable test taking practice which will help them gain admission to graduate schools. To induce the students to take the test more seriously, the student who made the highest score on the exam was given a free lunch with the faculty at Old Main Market, the campus cafeteria. A secondary goal was to have the students meet the faculty, one previous "winner" commented that going to lunch with the faculty was not as boring as they expected! Each correct answer was worth 1 point with a penalty of -.2 for incorrect answers. In the real GRE there is a penalty of -.25. A penalty of -.2 was chosen to encourage intuitive thinking. Pure guessing would give score of .68. On the actual physics GRE there are 100 questions for 170 minutes. To systematically work out a problem on the physics GRE takes from 5 to 15 minutes, assuming a good understanding of how to work the problem. Hence, informed guessing is very important to get a good score - a raw score of 50 is in the 59% percentile. 18 students took the exam. The mean score was 1.8 and the standard deviation was 2.2. A measure of the error is plus or minus .5 from the mean. A larger group of students would be helpful to draw meaningful conclusions. This would entail averaging over multiple years. A post test will be given to the 4370 class in the spring of 2017. The same test will be administered at the end of the semester. By giving the pretest and post tests in different semesters, the same test can be given, avoiding problems, of "teaching to the test" and varying difficulties of different versions of the GRE.

RELATED ITEM LEVEL 3

Previous GRE Exams

Action Description:

GRE Physics tests will provide a standardized assessment, which is normalized to national expectations for graduating seniors with the physics degree.

Provide The Necessary Basic Skills For Beginning Students In Physics, The Physics/engineering Dual Degree And Pre Engineering Programs

Goal Description:

The Department of Physics provides discipline-specific offerings for beginning students in physics, the dual degree in physics/engineering and pre engineering

RELATED ITEMS/ELEMENTS

RELATED ITEM LEVEL 1

Apply Foundational Concepts

Learning Objective Description:

Students who complete the second course in calculus based Physics will be able to apply foundational concepts, particularly in the areas of (1) proofs and derivations, and (2) translation of written problems into mathematical equations.

RELATED ITEM LEVEL 2

Comprehensive Exam

Indicator Description:

Students will complete a faculty-developed comprehensive exam in Physics 1411 assessing the common foundational concepts in Physics.

Criterion Description:

Eighty percent of students completing the exam will score 70% or higher on the comprehensive exam.

Findings Description:

Near the beginning of the spring semester of 2016, a faculty developed exam assessing foundational concepts in physics was administered to twenty physics 1411 students. Physics 1411 is the first semester in the calculus based physics sequence; the course is an introduction to Newtonian mechanics.

The assessment exam is therefore restricted to Newtonian mechanics. The test consisted of 20 multiple choice questions with 5 possible answers, no calculators were allowed. A full hour was allowed to take the test and there was no penalty for wrong answers. The student with the highest score on the exam won a free lunch with the physics faculty to Old Main Market, the university cafeteria. This was done to encourage the students to take the test seriously. The mean score was 5.9 with a standard deviation of 3.1. Therefore an estimate for the error in the mean is .7. A follow up exam will be given in the spring of 2017 near the end of the class to the physics 1411 students (different students). By giving the same exam to different groups of students the problems of teaching to the test and different difficulty levels of different versions of tests are avoided.

RELATED ITEM LEVEL 3

Comprehensive Exam

Action Description:

The department will implement comprehensive examination of required skills at the completion of each upper-division required course.

Update to Previous Cycle's Plan for Continuous Improvement

Previous Cycle's Plan For Continuous Improvement (Do Not Modify):

More data collection is necessary before any meaningful conclusion can be reached.

Update of Progress to the Previous Cycle's PCI:

More data was taken, but not enough to draw meaningful conclusions.

Only the initial assessment instrument was given for physics 1411 and physics 4370. This was done to avoid having the students take the same test at the beginning and the end of the semester or taking different tests of possibly different difficulties. The final assessment will be given to a different set of students in the upcoming year. A positive development is that physics 1411 and 4370 have been larger classes. There were roughly 35 in physics 1411 and 20 in physics 4370.

Plan for Continuous Improvement

Closing Summary:

The department will use nationally standardized assessment tools for quantification of mastery and retention of essential skills.