2. **SLO(s) being assessed:** Student will...

   SLO 10: Students will understand and appreciate methods and issues of science and technology.

3. **AGSC Content Area of Alignment:**

   Area III: Science and Math

4. **Assessment Method(s):**

   [Explain how assessment for the measures associated with this SLO - not grading for the course as a whole - was conducted. You may cut/paste rubrics for inclusion here, identify faculty reviewing committees, or identify specific kinds of test questions important to your method. Is this the method you initially planned to use? Provide a separate paragraph for each method].

   The department has identified the following assessment methods: homework problems, laboratory experiences, classroom interactive sessions and test/exam questions. Faculty may elect to use any or all of these assessment methods to evaluate the effectiveness of their teaching. The instructor teaching PHYS 1000 used a mixture of assessment methods: homework, lab activities, tests, and final examination. Several problems or activities that relate, as close as possible, to the intents of each of the five measures associated with SLO 10 were included in the assessments. The department committee overseeing this course met on March 28, 2013, to discuss the results of these assessments. The committee members were: Chin-Che Tin (Chair), Satoshi Hinata, Stuart Loch, Joseph Perez. Besides the committee members listed above, the committee chair also invited other faculty members teaching introductory physics courses to the meeting to participate in the discussion. In reconciling the language of the measures within Student Learning Outcomes #10 with the topics normally covered in the physics courses, the department has chosen to adopt the following interpretations of the different measures. Instructors have used these interpretations as a general guideline in their choice of questions. Measure 1: Use questions involving fundamental principles of physics such as the conservation laws. Measure 2: Use problems involving basic mathematical skills such as vector and scalar addition and subtraction, derivative and integration (for calculus-based class), finding slope and area (both algebra and calculus-based class), dot and cross products (calculus-based class), and common experimental techniques. Measure 3: Deduce information from graphical, tabulated, or experimental data.

   Measure 4: Problems showing connections between science and society involving topics such as energy, health, etc. Measure 5: Problems requiring knowledge and demonstrating analytical skills especially in those areas not covered above. The following grading scale was used to determine competency level and this was based on typical scores obtained from assessments over the last few years. Homework: ≥ 90%: Advanced Ability; 80% – 89%: Intermediate Ability; 70% – 79%: Basic Ability; ≤ 69%: Little or No Ability Test/Exam: ≥ 85%: Advanced Ability; 80% – 84%: Intermediate Ability; 79% – 59%: Basic Ability; ≤ 58%: Little or No Ability

5. **Findings: What assessment data did each assessment method produce?**

   Average score using tests/exam: 73.5%
   Average score using homework/lab: 80%

   Attachment name: PHYS1000-Fall2012.pdf

6. **Based on the comprehensive rubric for the appropriate SLO(s), indicate the extent of competency of the average student who has completed this core course in each learning outcome assigned to it:**
7. **How did you (or will you) use the findings for improvement?**

[What questions / issues / concerns did your data raise for the faculty teaching the course? What discussion did the faculty have about the findings? What future actions to improve student attainment of this outcome will the department / program take as a result of this analysis?]

The tests/exam score was slightly higher than usual for introductory physics courses. Scores for measure #2 were lower than those for other measures. Instructor should bear this in mind when covering the topics involved in the next class.

Homework scores were slightly lower than usual for introductory physics courses but laboratory scores were significantly lower than usual. Instructor would consider providing more help to the students to improve homework scores. Laboratory instructors should provide better lab instruction and supervision.

Generally, tests/exam scores are not comparable with homework/lab scores because of the stricter testing environment during tests/exam.

8. **Additional Comments:**

[What else would you like the Committee to know about your assessment of this course or plans for the future?]

The department continues to have strong reservations about the language used in the description of the various measures constituting SLO#10. The wording of the measures does not match with the typical questions normally used in our introductory physics courses. The faculty believes that the department should be the one to determine the proper questions to use in the assessments. The instructors were therefore asked to use their best judgment in choosing the appropriate questions with the broad intents of the measures in mind.

9. **Committee Comments:**
PHYS 1000 – Foundations of Physics  
Fall 2012  
Instructor: A  
Number of Students: 47  
Modes of Assessment:  
- Homework Assignment  
- Laboratory  
- Test/Exam

<table>
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<th>Measure</th>
<th>Item</th>
<th>% Average Score</th>
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Competency Level: Intermediate Ability
Measure 1: Articulate the philosophical and historical foundations of modern science.

1.1 Final Exam, Question 8
The synthesis of a large collection of information that contains well-tested and verified hypotheses about certain aspects of the world is known as a scientific
   A) fact.
   B) hypothesis.
   C) law or principle.
   D) theory.
   E) none of these

1.2 Final Exam, Question 9
In science, a theory is
   A) an educated guess.
   B) less than a fact.
   C) a synthesis of a large body of well-tested knowledge.
   D) unchangeable.

Measure 2: Understand the scientific method and demonstrate an ability to apply it across a variety of situations.

2.1 Chapter 19, Exercise 9
If the frequency of a wave is decreased, what will happen to its wavelength?

2.2 Final Exam, Question 4
The fundamental frequency of a violin string is 440 hertz. The frequency of its second harmonic is
   A) 220 hertz.
   B) 440 hertz.
   C) 880 hertz.
   D) None of the above choices are correct.

2.3 Final Exam, Question 5
An explosion occurs 34 km away. Since sound travels at 340 m/s, the time it takes for the sound to reach you is
   A) 0.1 second.
   B) 1 second.
   C) 10 seconds.
   D) 20 seconds.
   E) more than 20 seconds.

2.4 Final Exam, Question 11
When gas in a container is squeezed to half its volume and the temperature remains the same, the gas pressure
   A) halves.
   B) doubles.
   C) quadruples.
   D) remains the same.
**Measure 3:** Demonstrate an ability to conduct, and interpret the results of experiments aimed at better understanding natural phenomena.

### 3.1 Chapter 5, Exercise 13
Two 100 N weights are each hung, by a string, over opposite sides of a table. The two strings are then connected to opposite sides of a spring scale. What will the reading on the scale between them be?

### 3.2 Laboratory - Archimedes Activity
i) Determine the volume of the ring/tube using Archimedes’ Principle and compare your results to the volume of the ring/tube calculated from physical measurements.
ii) Determine the minimum number of pennies required to sink your block if the pennies are loaded on the block uniformly.

### 3.3 Laboratory - Loops / Magnets / Motors Activity
i) Determine the maximum AC voltage that can be achieved by rapidly oscillating a magnet through the provided coils.
ii) Build a working motor.

### 3.4 Laboratory - Series and Parallel Resistors Activity
Explore how voltages across resistors and currents going through resistors behave under various combinations of resistors in series and parallel. The students will also build circuits and verify the voltages, currents, and resistances using a multimeter.

**Measure 4:** Understand major issues and problems facing modern science and technology, including issues related to ethics, cultural values, public policies, and the impact of human activity upon the planet.

### 4.1 Chapter 9, Exercise 31
You and a friend are discussing space travel. Your friend asserts that astronauts are weightless because the gravitation force acting on them is very small, which is not the case on the surface of the Earth. Do you agree or disagree? Justify your answer.

### 4.2 Final Exam, Question 7
Radio waves travel at the speed of light, 300,000 km/s. The wavelength of a radio wave received at 100 megahertz is

A) 0.3 m.
B) 3.0 m.
C) 30 m.
D) 300 m.
E) none of these

### 4.3 Final Exam, Question 13
A dam is thicker at the bottom than at the top partly because

A) water is denser at deeper levels.
B) water pressure is greater with increasing depth.
C) surface tension exists only on the surface of liquids.
D) it looks better.
E) none of these
4.4 Final Exam, Question 14
A projectile is launched at ground level an angle of 15 degrees above the horizontal and lands down range. What other projection angle for the same speed would produce the same down-range distance?
   A) 30 degrees
   B) 45 degrees
   C) 50 degrees
   D) 75 degrees
   E) 90 degrees

4.5 Final Exam, Question 15
A gun with a muzzle velocity of 100 m/s is fired horizontally from a tower. Neglecting air resistance, how far downrange will the bullet be 1 second later?
   A) 50 m
   B) 98
   C) 100
   D) 490
   E) none of these

Measure 5: Demonstrate knowledge in one area of science, including understanding its basic principles, laws, and theories.

5.1 Chapter 22, Exercise 20
If all charges in the universe swapped signs (i.e. protons became negative and electrons became positive), would Coulomb's Law have to be rewritten?

5.2 Final Exam, Question 1
Moving electric charges will interact with
   A) an electric field or a magnetic field.
   B) only a magnetic field.
   C) only an electric field.
   D) none of these

5.3 Final Exam, Question 2
The current through a 10-ohm resistor connected to a 120-V power supply is
   A) 1 A.
   B) 10 A.
   C) 12 A.
   D) 120 A.
   E) none of these

5.4 Final Exam, Question 3
When the distance between two charges is halved, the electrical force between the charges
   A) quadruples.
   B) doubles.
   C) halves.
   D) is reduced by ¼.
   E) None of the above choices are correct.