Core Curriculum Assessment Report
2011_12

Department Physics

Representative Dr. Chin-Che Tin

Course Name / number PHYS1000

1. **AGSC Content Area of Alignment:** Area III: Science and Math

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

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

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

   [Explain how assessment for the measures associated with this SLO - not grading for the course as a whole - was conducted. You my cut/paste rubics 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 assessment of this course comes under the purview of the Department of Physics' Learning Improvement Committee for Introductory Physics and Astronomy, chaired by Dr. Chin-Che Tin. The committee believes that learning assessment should not be viewed as a measure of the teaching effectiveness of the instructors. To discourage such unwarranted association and to encourage participation in the assessment efforts, the committee has decided not to identify the instructors. However, during the committee meetings to discuss assessment data, the instructors may choose to identify themselves to aid in the discussion, and many instructors did.Members of the Learning Improvement Committee for Introductory Physics and Astronomy were:Dr. Chin-Che Tin (Chair)Dr. Satoshi HinataDr. Stephen KnowltonDr. Stuart LochDr. Joseph PerezThe Chair of the committee has the prerogative to invite other instructors teaching those courses under the purview of this committee but who are not members of the committee, to the meetings.The instructor in this course has chosen homework assignments as the mode of assessment. This is one of the methods accepted by the department for learning assessment.The questions shown in the attached file under each measure are homework assignments from the text - Conceptual Physics, 11th Edition, Paul G. Hewitt, Addison Wesley, 2010. There is one problem from each chapter covered in both semesters.Data were collected for Fall 2011 and Spring 2012.The SLO data were submitted to the Chair of the Learning Improvement Committee for Introductory Physics and Astronomy, Dr. Chin-Che Tin, after the end of Spring semester 2012. The committee met on Sept 27, 2012, to discuss the assessment data for this course.

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

   Average score for Fall 2011: 71%Average score for Spring 2012: 79%In 12 out of the 15 questions, there was improvement in the average score from Fall 2011 to Spring 2012.These scores were lower than those of other instructors using MasteringPhysics assignment.

5. **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?]

   Instructor’s Verbatim Comments:Of the 15 questions, improvement from Fall to Spring was made on 12. Does this mean I was a much better teacher in the Spring than in the Fall? I doubt that this data warrants any such conclusion. I do think, however, that learning in the Spring semester improved.Aside from that, I must admit that I am not smart enough to extract any great significance from such data. I will have to leave that to the folks from the College of Education.While I am not teaching this class in the coming semesters, I will do what I have always done in the past 24 years, i.e., try to do better each semester. I am hard pressed to find appropriate words for the members of the assessment community who contend that wasting time collecting this data and typing this report is going to help me improve and, that on the other hand if I do not follow such a shallow procedure, I am not trying to improve.

6. Additional Comments:

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

Finding appropriate problems suitable for Measures 1 and 4 continues to be a problem in our assessment efforts.

7. Committee Comments

Mean of rubric score: 2.5 (out of 4)Questions allegedly assessing Measures 2 and 3 have nothing to do with Measures 2 and 3.Since questions don't relate to Measures, then no findings can logically emerge, comments don't explain this at all.Little revision suggested, except search for some better questions for measures 1 and 4, where the weakness is in measure 2 and 3.

PHYS 1000 – Foundations of Physics
Fall 2011-Spring 2012
Instructor A
Mode of Assessment: Assignments

Measures	Problems	% Average Score	
		Fall 2011	Spring 2012
1	1.1	65	74
2	2.1	58	75
2	2.2	62	72
2	2.3	66	85
3	3.1	70	67
3	3.2	64	84
3	3.3	75	71
3	3.4	79	77
4	4.1	91	95
4	4.2	76	81
4	4.3	75	79
5	5.1	83	84
5	5.2	72	79
5	5.3	52	71
5	5.4	81	91
Average		71.3	79.0

PROBLEMS:

Measure 1: Articulate the philosophical and historical foundations of modern science.

1.1 Chapter 32, Exercise 28
When and where do Newton's laws of motion and quantum mechanics overlap?

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

2.1 Chapter 3, Problem 6
A dart leaves the barrel of a blowgun at a speed v. The length of the blowgun barrel is L. Assume that the acceleration of the dart is uniform.
a. Show that the dart moves inside the barrel for time of $2L/v$.
b. If the dart's exit speed is 15.0 m/s and the length of the blowgun is 1.4 m, show that the time the dart is in the barrel is 0.19 s.

2.2 Chapter 7, Problem 10
Emily holds a banana of mass m over the edge of a bridge of height h. She drops the banana and it falls to the river below. Use conservation of energy to show that the speed of the banana just before hitting the water is $v = \sqrt{2gh}$

2.3 Chapter 26, Problem 8
The wavelength of light changes as light goes from ne medium to another, while the frequency remains the same. Is the wavelength longer or shorter in water than in air? Explain in terms of the equation speed = frequency x wavelength. A certain blue-green light has a wavelength of 600 nm (6×10^{-7}m) in air. What is its wavelength in water, where light travels at 75% of its speed in air? In Plexiglas, where light travels at 67% of its speed in air?

Measure 3: Demonstrate an ability to conduct, and interpret the results of experiments aimed at better understanding natural phenomena.

3.1 Chapter 5, Problem 6
You are paddling a canoe at a speed of 4 km/h directly across a river that flows at km/h.
(a) What is your resultant speed relative to the shore?
(b) In approximately what direction should you paddle the canoe so that it reaches a destination directly across the river?

3.2 Chapter 6, Problem 10
An ostrich egg of mass m is tossed at a speed v into a sagging bed sheet and is brought to rest in a time t.
a. Show that the force acting on the egg when it hits the sheet is mv/t.
b. If the mass of the egg is 1 kg, its initial speed is 2 m/s, and the time stop is 0.2 s, show that the average force on the egg is 10 N.

3.3 Chapter 28, Problem 6
The diameter of the Sun makes an angle of 0.53^o from Earth. How many minutes does it take the Sun to move 1 solar diameter in an overhead sky? (Remember that it takes 24 hours or 1440 minutes for the Sun to move through 360^o). How does your answer compare with the time it takes the Sun to disappear, once it lower edge meets the horizon at sunset? (Does refraction affect your answer?)

3.4 Chapter 34, Problem 3
An important fusion reaction in both hydrogen bombs and controlled-fusion reactors is the "DT reaction," in which a deuteron and a triton (nuclei of heavy hydrogen isotopes) combine to form an alpha particle and a neutron with the release of much energy. Use momentum conservation to explain why the neutron resulting from this reaction receives about 80% of the energy, while the alpha particle gets only about 20%.

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 11, Exercise 31
Somebody told your friend that if an antimatter alien ever set foot upon Earth, the whole world would explode into pure radiant energy. Your friend looks to you for verification or refutation of this claim. What do you say?

4.2 Chapter 23, Problem 10
In periods of peak demand, power companies lower their voltage. This saves them power (and saves you money!). To see the effect, consider a 1200-W coffeemaker that draws 10 A when connected to 120 V. Suppose the voltage is lowered by 10% to 108 V. By how much does the current decrease? By how much does the power decrease? (*Caution:* The 1200-W label is valid only when 120 V is applied. When the voltage is lowered, it is the resistance of the toaster, not it power, that remains constant.)

4.3 Chapter 33, Problem 6
Suppose that you want to find out how much gasoline is in an underground storage tank. You pour in 1 gallon of gasoline that contains some radioactive material with a long half-life that gives off 5000 counts per minute. The next day, you remove a gallon from the underground tank and measure it radioactivity to be 10 counts per minute. How much gasoline is in the tank?

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

5.1 Chapter 4, Problem 7
A rock band's tour bus, mass *M*, is accelerating away from a STOP sign at a rate *a* when a piece of heavy metal, mass *M/6*, falls onto the top of the bus and remains there.
a. Show that the bus's acceleration is now *6a/7*.
b. If the initial acceleration of the bus is 1.2 m/s^2, show that when the bus carries the heavy metal with it, the acceleration will be 1.0 m/s^2.

5.2 Chapter 18, Problem 8
Construct a table of all the possible combinations of numbers that can come up when you throw two dice. Your friend says, "Yes, I know that 7 is the mos likely total number when two dice are thrown. But *why 7*?" Based on your table, answer your friend, and explain that, in thermodynamics, the situations that are likely to be observed are those that can be formed in the greatest number of ways.

5.3 Chapter 22, Problem 10
In 1909, Robert Millikan was the first to find the charge of an electron in his now-famous oil-drop experiment. In that experiment tiney oil drops were sprayed into a uniform electric field between a horizontal pair of oppositely charged plates. The drops were observed with a magnifying eyepiece, and the electric field was adjusted so that the upward force on some negatively charge oil drops was just sufficient to balance the downward force of gravity. That is, wehn suspended, upward force *qE* just equaled *mg*. Millikan accurately measured the charges on many oil drops and gound that values to be whole-number multiples of 1.6 x 10^{-19}C - the charge of te electron. For this he won the Nobel Prize.
a. If a drop of mass 1.1 x 10^{-14} kg remains stationary in an electric field of 1.68 x 10^{5} N/C, what is the charge of this drop?
b. How many extra lectrons are on this particular oil drop (given the presently known charge of the electron)?

5.4 Chapter 24, Exercise 42.
What changes in cosmic-ray intensity at Earth's surface would you expect during periods in which Earth's magnetic field passed through a zero phase while undergoing pole reversals?