Physics 111/Physics 116 - Introductory Physics & Intro. Physics Laboratory

Course Description (including laboratory, if necessary):

Physics 111 is a one-semester, 3-credit course that provides a general survey of classical and modern physics topics for liberal arts and social science students. *Physics 111* meets for three one-hour lectures per week, and *Physics 116* meets for one two-hour laboratory per week. The lecture portion of *Physics 111* introduces several topics: Newton's laws of motion and gravity; electricity; magnetism; sound waves; modern physics (atomic and nuclear); and an introduction to quantum mechanics. The *Physics 116* laboratory is optional and is designed to teach fundamental physics concepts, basic laboratory techniques, and concepts of measurement and measurement error. This lab is designed for elementary education majors (K-6). Successful completion of both courses may satisfy a student's natural science lab credit. The course is offered during both the fall and spring semesters, and typical enrollment is around 200 students.

Students will gain the following skills:

- General understanding of major physics topics
- Connect physics concepts to everyday life examples
- Understand basic concepts, terminology, and history of physics
- Application of basic (one-step) math formulae
- Ability to convey physics concepts to elementary students through experimentation (lab)

Which students take this course:

Students interested in a conceptual overview of physics topics, with less math emphasis, should take this course. The general audience includes liberal arts and social science majors, with a few health science, allied health, and OT/PT students.

Students who lack basic math and study skills should strengthen these skills before attempting this course (see pre-test below). If a student is undecided on a major and is considering a science major, s/he is permitted to take this course; however, the student may later be required to take *Physics 114* or *211,* depending on the their eventual major. This course does not satisfy the requirements for engineering students.

Distinctions between similar courses:

The primary difference between this and other entry-level physics courses is that this course is designed for non-science and elementary education majors. As a one-semester course,

topics are covered at a general level, with fewer derivations of mathematical equations relative to other physics courses.

Prior Knowledge and Skills required of student:

Although these courses have a reduced math component compared to other entry-level physics courses, eligibility for *Math 104* is required. Students will need to perform basic algebraic manipulations.

To succeed in PHSX 111, students should be able to do these problems *BEFORE* enrolling in the course.

1. Write these numbers in scientific notation: a) 2,300,000 b) 0.0000456

2. Translate these numbers from scientific notation: a) 5.6×10^{3} b) 7.6×10^{-4}

3. How many seconds are there in the month of August?

4. Find x: a) $2=3x$ b) $5=4x + 7$

5. A rectangle has area 47 m^2. If the long side has length 8.1 m, what is the length of the short side?

In addition, a student should be able to read, comprehend, and extract information from text similar to the sample below (Kirkpatrick and Wheeler, 1995):

Since the velocity of many things are not constant, we need a way of describing how velocity changes. We now define a new concept called acceleration that describes the rate at which velocity changes. The magnitude of the average acceleration of an object is that change in its velocity v divided by the time it takes to make that change, $\bar{a} = \frac{\Delta v}{t}$. The symbol Δv is called "delta vee." The delta symbol Δ is used to represent a change in a quantity. Thus, Δv represents the change in velocity and must not be thought of as the product of Δ and v. To calculate the change in velocity we subtract the velocity at the beginning of the time interval from the velocity at the end. As we did with speed, we can speak either of the average acceleration or the instantaneous acceleration, depending on the size of the time interval.

Examples of coursework students will encounter in PHSX 111:

1. A car speeds up from 50 mph to 70 mph to pass a truck. If this requires 6 s, what is the average acceleration of the car?

2. Which of the following statements about the Moon is correct?
   A. The moon has a constant velocity.
   B. There is no net force acting on the moon
   C. The Earth exerts a stronger force on the Moon that the Moon exerts on the Earth
   D. The Moon experiences a centripetal acceleration toward the Earth

3. If Galileo and his assistant were 15 km apart, how long would it take light to make the round trip? How does this time compare with reaction times of about 0.2 s?

4. A woman with a weight of 600 N on Earth is in a spacecraft accelerating through space a long way from any massive objects. If the acceleration is $4/m^2$, what is her weight in the ship?