Physics 114/Physics 115 - College Physics I and II (4 credit hours each)

Course Description (including laboratory, if necessary):

Both courses meet for three one-hour lectures and one two-hour laboratory each week, with an optional one-hour discussion. The lecture portion of *Physics 114* introduces principles and applications of several topics: Newton's laws of motion and gravity (causes and descriptions of linear and rotational motion), conservation laws (angular momentum, mechanical energy, and momentum), thermodynamics (energy, heat, and temperature), fluids, and sound waves. *Physics 115* covers electricity, magnetism, modern physics (atomic and nuclear), and introduction to the electromagnetic spectrum. The *Physics 114* laboratory introduces topics, such as causes and measurement of error and data analysis. The *115* course builds on the ideas of energy and force introduced in the first semester and adds the new concepts of electricity and magnetic forces. The *114/115* labs are very similar to the *211/212* labs, except that error analysis is simplified.

Students will gain the following skills:

- Broad background in physics
- Ability to solve simple one- or two-step physics problems
- Develop problem-solving strategies to solve for unknown variables
- Recognize and account for error in measurement (lab)
- Ability to write lab reports (lab)
- Ability to manage spreadsheets for data analysis (lab)

Which students should take this sequence of courses:

Students with strong math backgrounds in algebra and trigonometry and who are interested in a broad overview of qualitative physics concepts and basic problem solving are encouraged to enroll in this course. The general audience includes architecture, biology, earth science, nursing, and some engineering students. This course is designed to prepare biology and pre-med students for the MCAT. Students in 114/115 typically pursue careers in health, biological, and general sciences.

Distinctions between similar courses:

Essentially, *114* and *115* condense three semesters worth of topics (*211*, *212*, and *313*) into two semesters. The list of topics for *Physics 114* is very similar to *211*, while *115* is very different from *212*. While problem solving is an important element of *114/115*, it is not performed to the depth required in *211/212*. Students interested in a one-semester survey

course should consider *Physics 111/116*, a concepts-based one-semester lecture course. Physical science and most engineering students should take *211/212*.

Prior Knowledge and Skills required of student:

These courses are algebra-based physics courses, with *Math 104* as a pre-requisite. In lieu of *Math 104*, the student may have three and one-half years of college-preparatory mathematics including trigonometry or a score of 25 or higher on ACT mathematics section. No knowledge of derivatives or integrals is required.

To succeed in PHSX 114/115, students should be able to do these problems *BEFORE* enrolling in the course.

PRE-TEST

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}

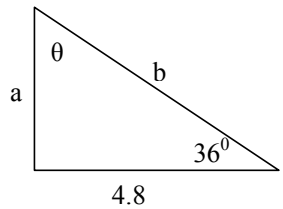
3. How many seconds are there in the month of August?

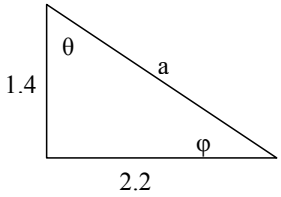
4. Find x: a) $2=3x$ b) $5=4x+7$

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?

6. Find x: a) $3x^2+5x+1=0$ b) $\ln(x) = 5.6$
c) $e^x=5.6$ d) $\sin(x) = 0.445$

7. For the right triangles shown below, find the missing angles and lengths:





8. Solve these two simultaneous equations for the two unknowns: $3x+2y=7$, $5x-y=3$.

In addition, a student should be able to read, comprehend, and extract information from text similar to the sample below (Giancoli, 2004):

An object whose velocity is changing is said to be accelerating. For instance, a car whose velocity increases in magnitude from zero to 80 km/h is accelerating. Acceleration specifies how rapidly the velocity of an object is changing.

Average acceleration is defined as the change in velocity divided by the time taken to make this change:

$$\text{Average acceleration} = \frac{\text{change of velocity}}{\text{time elapsed}}$$

In symbols, the average acceleration, a, during a time interval $\Delta t = t_2 - t_1$ over which the velocity changes by $\Delta v = v_2 - v_1$, is defined as

$$\bar{a} = \frac{v2 - v1}{t2 - t1} = \frac{\Delta v}{\Delta t}$$

Examples of coursework students will encounter while enrolled in PHSX 114:

1. A child on a merry-go-round is moving with a speed of 1.9 m/s and sits 1.5 m from the center of the merry-go-round. What is the child's centripetal acceleration?

2. A block starts from a frictionless incline that is at an angle of 25° to the horizontal. Find the velocity of the block after it has traveled 11 m along the incline.