January 2009

Physics 132 – General Physics II (4)
(Also listed as HNRS 132)
Course Outline GE B3 & B4

Prerequisite for Phys 132: PHYS 131 or HONORS 131 or PHYS 141.

Learning Objectives and Criteria:
Upon completion of the course the student is expected to know:

a: That many dynamic systems describe simple harmonic motion when displaced from equilibrium.
b: That wave propagation depends on the nature of the medium.
c: That the wave velocity is distinct from the velocity of the medium through which the wave travels.
d: The definition of absolute temperature through the constant volume gas thermometer.
e: To convert between the various temperature scales such as Kelvin, Celsius and Fahrenheit.
f: The thermodynamic definition of the work done by a system.
g: How to apply the first law of thermodynamics to thermal processes.
h: To realize that engines which convert heat into mechanical work are inherently inefficient because of the restrictions of the second law of thermodynamics.
i: To calculate the optimum efficiency of an engine working between two well-defined temperatures.
j: The law of refraction of light and how images can be formed by both mirrors and lenses.
k: The workings of some simple optical instruments such as the magnifier, the microscope, the telescope and corrective eyeglasses.
l: The wave nature of light which leads to interference and diffraction effects.

Text and References:
Young and Freedman, University Physics, 12th edition, Pearson Addison Wesley, 2008.

Physics 132 is the second in our Phys 131/141, 132, 133 calculus-based sequence. It is required of all physics majors, all engineering students, as well as students in chemistry, mathematics, and architecture. In this course, the students are exposed to scientific reasoning in lecture and will have to use this approach in their homework assignments. They will learn to set up problem solutions from given information in an organized and systematic method using mathematics and the laws of physics. In Physics 132, as in Physics 131/141, students are constantly reminded and shown that many problems that arise can be solved through the logic of mathematics and physics. They will become familiar with the language of science and its methods. This course is essential background in more advanced courses in both physics and engineering.

Content and Method:

Method: Physics 132 is offered in a traditional lecture/lab format. It meets a total of 6 hours each week - 3 hours of lecture and one 3-hour lab.

Content: Physics 132 will adhere to the following course content:

- Fluids, hydrostatic pressure, Archimedes' principle.
- Simple harmonic motion, the simple pendulum, physical pendulum.
- Wave motion, frequency and wavelength, wave velocity, velocity of the medium, standing waves, interference.
- Sound waves, resonance in pipes, the Doppler effect.
- Thermometers, temperature scales, thermal expansion, calorimetry, work done in thermodynamics, first law of thermodynamics.
- Ideal gases, the kinetic theory of gases, root mean square velocities, thermodynamic cycles.
- The second law of thermodynamics, the Carnot cylce, Carnot efficiency and efficiencies of thermal engines.
- Reflection and refraction of light waves, image formation by reflectors (mirrors).
- Image formation by refractors (lenses) , some simple optical instruments, diffraction of light waves.
- Diffraction and interference of light waves.

Lab Sections:

The multiple sections of the course will all do the same experiment in a given week. Usually the students will perform 10 experiments in a given quarter. The students typically work in groups of three at each of the 8 stations, limiting the class size to 24. The students will spend most of the 3-hour period collecting and analyzing data. They will then be required to analyze their data and discuss their results in a written or oral report. In a typical quarter, the students will do the following experiments:

- Simple pendulum. Data taking and analysis.
- Simple harmonic motion
- Standing waves
- Resonance of sound waves
- Thermometers
- Calorimetry
- Thermodynamic processes
- Refraction of light
- Thin lenses
- Interference/ diffraction

To ensure uniformity as much as possible, the instructor in charge of the course provides the syllabus for all instructors involved in the course. The syllabus outlines the chapters and topics to be covered for a given week as well as the homework assignments for that particular week. All students in the various sections will do the same laboratory experiment scheduled for that particular week.

Methods of Assessment:

Lecture/Lab Sections: The methods of assessment, in order of importance, are:
Exams (2 or 3 one-hour exams and a final exam); Weekly homework assignments; Quizzes; Laboratory reports.