

- **Text:** *Interactive and Discovery Laboratory Experiments for Life Science Students*; lab notes will be distributed at the beginning of the semester and lab instructions will be available on the hard drive in the computers in M 257.

- **Course Content:** Selected experiments in thermodynamics, electricity, magnetism, wave motion, physiology, and modern physics will be performed. Emphasis will be on the interactive-discovery approach to experimental work in physics. The purpose of this is to give the student a more realistic laboratory experience. For example, this will entail the use of a lab notebook to keep a detailed record of weekly experimental work. Extensive use will be made of state-of-the-art computers and software. Students will be expected to perform in the laboratory setting all the work necessary to write a complete lab report.

Students are to read the text and the instructions before coming to the laboratory in order to familiarize themselves with the experiment.

- **Implementation:** Unannounced five-minute quizzes on the material for the experiment will be given at the beginning of the lab. ***These quizzes will count toward the final grade.*** As mentioned above students will keep a weekly record of their experimental work in a loose-leaf binder. At the conclusion of each lab, a short summary of the results of that lab is to be entered at the end of that section in the lab notebook. The lab notebook is to be a personal, precise and concise record of your experimental work. All calculations and graphical analyses are to be entered into this lab notebook. This requires that the student perform these operations during the lab period. ***The two formal lab reports will be due the week of 2/27/06 and 4/10 & 17/06. Each student is to submit his/her own report.*** Students may schedule a conference with their professor to discuss revisions of their report. The laboratory will be available to the students at times other than the normal lab periods.

- **Grading:** ***The completed lab notebook will be a prerequisite for completion of the course requirements.*** This notebook will be reviewed twice, during the weeks of February 27 and April 24, 2006. At the discretion of the instructor, five-minute closed-book quizzes will be given at the beginning of the lab period. The final grade will be based equally upon the two lab reports, lab performance, the short quizzes, and, the lab final. Since this lab course will emphasize in-house work, this evaluation of lab technique will be an important component of the final grade. All these aspects of the course will be discussed frequently so that all are well aware of the course expectations.

- **Goals:** In addition to the more traditional goals of observing and analyzing physical data relevant to some of the classical experiments in wave motion, electricity and magnetism, and modern physics, upon the successful completion of this lab course, you should be proficient in the utilization of the computer as an integral component of the experimental apparatus. In addition to this you should have developed sufficient skill in the use of the data collection and analysis software *Data Studio*. Although you may not use *Data Studio* in future experimental work, it should serve as a useful prototype for other applications. Finally and certainly of equal importance, you should have developed the skill to keep a detailed lab notebook and with this write a clear, coherent scientific paper in which to present the results of your experimental work.

- **Office Hours:** Th and F 2:00 to 4:00 PM

- **Lab Attendance:** An unexcused absence will have a serious effect on your final grade. You will be allowed to make up only one experiment during the week of May 1st and only at the discretion of the lab instructor. This make-up lab will be the same for all students. It is strongly recommended that if you miss a lab for a *legitimate reason*, you should make up the missed lab during the same week at another regularly scheduled lab period.

- **Experiments -**

| Week of: | Experiment |
|-----------------|--|
| January 23 | Simple Harmonic Motion |
| January 30 | Standing Waves |
| February 6 | Newton's Law of Cooling with a Finite Reservoir |
| February 13 | Light Intensity from a Point and a Linear Source |
| February 20 | Attenuation of Light Intensity |
| February 27 | Radioactivity - Activity and Decay - 1 st Report Due |
| March 13 | Radioactivity - Absorption |
| March 20 | Physics and Physiology |
| March 27 | Joule Heating |
| April 3 | The Charging and Discharging of a Capacitor |
| April 10 & 17 | The Charge to Mass Ratio for the Electron - 2 nd Report Due |
| April 24 | Induced EMF - Laws of Faraday & Lenz |

Villanova University

Department of Physics

Interactive and Discovery

Experiments in Physics

for Life Science Students

Spring 2006

Prof. M. Hones

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