Physics 284 Modern Physics Laboratory

Spring 2014

Wednesdays, 12:00 – 2:50 PM , Faraday 121A

Instructor:
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Web Site
http://webcourses.niu.edu (Blackboard course page)
Grades and class materials such as lab instructions will be placed on the Blackboard course page.

Lab Instructions
Instructions for all the labs are available on the web and must be downloaded and read in advance of showing up for class.

Grading
The laboratory grade will be based on 7 (or 8) equally weighted lab reports. The reports should be approximately 4-5 pages in length (including figures and data tables). General guidelines for how to complete lab reports and a breakdown of how lab reports will be graded are provided on the class web page. Each lab instruction sheet will also have some specific guidelines. **Lab reports are due one week after the completion of the lab.** Reports submitted late without prior permission will be marked down 10% per week and will not be accepted more than 3 weeks after the due date or 1 week before the beginning of final exam week, whichever occurs sooner.

Lab Notebooks
All students are expected to keep a lab notebook. Since students will work in teams of two, they should either purchase a lab notebook with carbon paper, or make photocopies at the end of class, so that each student retains a copy of the notes. A copy of the relevant pages of the lab notebook should be attached to the back of each lab report. It is each student's responsibility to make sure that they obtain a copy of all the notes from each lab.

Independent Project
The last laboratory will be an independent project of the student's choosing. Students should discuss ideas for their independent lab with the teacher assistant (TA) or instructor on record. The project will be graded based on only the lab notebook. Even if your independent project does not succeed, it is sufficient to demonstrate that you have made a careful effort, kept good notes, and proceeded in a scientific manner. While students are encouraged to come up with their own ideas, a short list of some suggested projects is included at the end of the syllabus. Students can work in groups of up to four on their independent project.

Calendar:

Jan. 15	No Lab
22	Statistics Lab and error analysis
29	Intro to Optics Labs (Lecture)
Feb. 5	Interference/Diffraction/PhotoElectric
12	Interference/Diffraction/PhotoElectric
19	Interference/Diffraction/PhotoElectric
26	Intro to Radiation Safety (Lecture)
5-Mar	Intro to Atomic and Nuclear Labs (Lecture)
19	Frank Hertz/Photo Electric and E/M Labs
26	Frank Hertz/Photo Electric and E/M Labs
2-Apr	Frank Hertz/Photo Electric and E/M Labs
9	Independent Project
16	Independent Project
23	Independent Project
30	No Lab

Optics Labs
Michaelson Interferometer
Diffraction Grating
Photoelectric Effect

Atomic and Nuclear Labs
Frank-Hertz Experiment
Electron charge to mass ratio
Radioactive Decay

Some Independent Project Lab Ideas (feel free to come up with your own)

a) Comparison of the spectrum of a fluorescent light bulb with an incandescent light bulb using the spectrometer.
b) Electronic measurement of light intensity using a photodiode.
c) Observation of the Meissner effect in a superconductor.
d) Automation of an experiment using the Labview software and an interface board.
e) Observation of magnetic domains.
f) Measurement of the spectrum of a star using the observatory.
g) Measurement of the flux or energy spectrum of cosmic rays.
h) Measurment of the spectrum of beta particles.
i) Observation of alpha-decay tracks in a cloud chamber.
j) Measurement of Compton scattering of x-rays.
k) Measurement of electron diffraction with electron microscope. (Need to obtain permission from Dr. Ito)
l) Try to use a Michelson interferometer to measure the width of the Hg line. Compare this with an estimation based on a diffractometer.
m) Put together measurements from the e/m experiment, the spectrum of hydrogen with the spectrometer (which provides a value of the Rydberg constant) and the h/e experiment (photoelectric affect) to obtain values for m, e and h independently instead of just their ratios.
n) Compare the accuracy of the spectrometer used in the spectrometer lab with a newer model spectrometer the department is thinking of buying to replace them. See if the new one is better or worse.