Course Description:
The lab session of Physics 214 consists of a series of modern physics experiments. Each experiment has a document folder with information on background, physics concepts, and detailed instructions on this experiment. These experiments are left fairly open ended to allow you many routes of investigation and exploration. The intention of this lab is to provide a fun environment in which to do some classic modern physics experiments, as well as to expose you to some state-of-the-art research equipment. You will work on one assigned experiment each week and write an independent lab journal. Each experiment lab manual gives detailed instructions on how to start up the experiment. Follow these instructions carefully so that no one gets hurt and nothing gets broken. You are expected to arrive promptly at 1:10pm and spend the full 2 hours and 50 minutes working on each experiment.

Student learning goals:
In this lab course, you are expected
- To exercise curiosity and creativity, develop physics intuition and critical, quantitative thinking, and deepen understanding of physical concepts.
- To develop reporting skills, written and oral, by keeping a lab journal and by discussing work with instructors and fellow students.
- To develop experimental and data analysis skills, as well as exploring the sources for errors.

You will be expected to conduct these experiments on your own! That means, attempting to solve any problems or issues you run into on your own. My role is as a helper, to get you through problems when you really get stuck or to make sure things don’t get damaged—you should ask me questions, or course, but don’t be surprised to get questions back in response. After three semesters or more of learning physics theory and application, this is your chance to start being a real physicist.

Lab Journals:
Your lab journals are a record of your progress in these experiments. Write in them explicitly and often. During the experiment, you may use them to take notes on procedures, write up quick calculations, write data in tables, or jot down questions. The lab manuals ask you many
questions—these are good places to stop and evaluate where you are and attempt to answer the questions in your lab book.

As you wrap up each experiment, you should then transition into a results reporting section—this may include final calculations based on data you take during the experiment, plots (hand-drawn or better yet, printed out computerized versions) that give graphical results, and, most importantly, a summary paragraph which captures what you did in the lab, what were the important results, trends or calculations you found, and what errors or problems you ran into.

As frequently as possible, you should include error analysis in any result your present. I will hand out a very good introduction to error analysis courtesy of Professor Cheng when we start the lab.

**Evaluation:**

There is no formal grade component of this lab—however, a successful completion of each experiment in this lab is a requirement for passing the overall 214 course.

A successful completion of an experiment will consist of 1) your attendance, of course, for the full lab period, 2) a willing engagement in the lab experience, and 3) an adequate lab journal write-up of the experiment. This lab is supposed to be a fun experience and as such, none of these requirements should be onerous.

Your lab journal will not be formally evaluated either. These lab journals are your personal record of the experiment and there is no one right way to construct such a write-up. I will occasionally however look through each journal to observe your style and make comments or suggestions. The journals should remain in the lab room throughout the semester.

If you miss a lab, you MUST make it up. There are 12 experiments in total and you must complete all 12 to pass 214. If you are going to miss an experiment for some reason, let me know so that we can plan a make-up time right away.

**KaleidaGraph:**

To help with plotting and tables, there are computers in 154 with KaleidaGraph installed. This is a very useful program for presenting results. If you do not have much experience using such a program, consider this lab an opportunity for using this software as well. Any plots or graphics you generate based on lab data should be rendered in KaleidaGraph and then printed so you can place it in your lab journal.

**Lab Policies:**

- Lab runs from 1:10–4:00pm. Please be on time. You will know ahead of time which experiment you are to conduct each week so you can go directly to that station.
- Some experiments may appear to take longer than others, but you work must on the experiment in some form until at least 3:50pm. Some experiments may take nearly the whole time just to get data, while others may only take half of the lab period. If a given experiment runs short, consider this an opportunity to explore more on your own, perhaps thinking of additional experiments to run. Come see me if you have ideas and maybe we can set up something new. You can also use this time to perfect your lab write up. Make your plots extra informative or accurate, etc.

- Eating or drinking is not allowed in the lab. There is a desk outside of the lab where you can keep food or drink to have during the lab session.

- At the end of each lab session, you will need to clean up your station, turn off all equipment and hand in your lab journal.