Physics 152—Accelerated Physics II: Electricity, Magnetism, and Optics LAB
Section 1L, Tuesday 1:10 – 4:00 p.m.
Course Description, Fall 2017

Instructor:	Andrew Dougherty
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Office Hours: Please see the enclosed schedule. Beyond those designated office hours, I will usually be either in my office or lab during the free times indicated on my schedule. Please feel free to call, e-mail, or stop by at any time and ask a question or set up an appointment.

Classes on Snow Days and Other Emergencies: If I am unable to make it to class, I will leave send an email out via Moodle or leave a message on my voice mail (610-330-5212).

Description: This lab is designed to accompany the Phys 152 lecture class. A number of experiments will deal with electrical circuits, since they are such an important class of applications. The primary goals of this lab are to enhance your understanding of the basic physics you will be studying, and to continue to introduce you to the *process* of doing physics. In addition, I hope to help you learn a number of general principles and ideas that apply in many laboratory situations, such as how to determine for yourself what techniques and procedures to follow to explore a particular phenomenon, how to estimate the origin, magnitude, and importance of uncertainties in your results, how to judge whether or not to believe the results, and what to do when things go wrong.

Text: You should purchase the *Physics 152 Laboratory Manual Fall 2017* in the bookstore. Each lab **team** will also be required to keep a bound laboratory notebook (not a loose-leaf binder) for recording your work. I don't require a specific type of notebook, but you must use one that is sturdy enough that the pages don't fall out. During the semester, you will often have to refer back to previous experiments to review how to do certain tasks. If you have your old lab notebook from first semester physics, you may use that.

Learning Outcomes: After completing this course, you should be able to

1. Apply the basic principles from the associated lecture class to a variety of laboratory situations.
2. Generate and use data to test theoretical predictions, including making appropriate graphs, fitting simple functions to data, and incorporating basic uncertainty analysis to assess whether the data support the theory.
3. Estimate the origin, magnitude, and importance of uncertainties in your results.
4. Summarize your results in a laboratory notebook.

In addition to the outcomes listed above, this course (particularly the lab component) will promote the following outcomes from the Natural Sciences section of the Common Course of Study:

- NS 1 Employ the fundamental elements of the scientific method in the physical and natural world.

  - NS 1a Identify and/or formulate a testable scientific hypothesis.
  - NS 1b Generate and evaluate evidence necessary to test and/or revise a hypothesis.
- NS 2 Create, interpret, and evaluate descriptions and representations of scientific data including graphs, tables, and/or models.
- NS 3 Understand how scientific uncertainty informs the evaluation of hypotheses.

Attendance: You are responsible for completing all of the assigned experiments at the scheduled times. Make-up labs are not normally available for unexcused absences. You can't count on the equipment being available outside the scheduled times.

General Strategy:

Come to lab prepared. Students who read the lab manual *before* coming to lab are more likely to learn something from it, and much more likely to complete the lab quickly and correctly.

Ask questions. Even after you read the lab carefully, you will likely have questions. You should not expect to understand everything entirely on your own—knowing when to ask a question is also an important skill.

Don't give up easily. Most experiments are designed to work reasonably well. If your experiment is apparently not working, check with me.

Conduct of Labs: Lab should be an informal learning experience. Feel free to ask questions of me and your fellow students. Remember, however, that the purpose of the lab is to learn, so you should not simply copy what someone else does. Instead, you should make sure you understand what you need to do. Also, if you do consult anyone (besides your instructor), be sure to acknowledge that in your lab notebook.

Academic Honesty: Please consult the departmental policy on academic honesty. You should have received a copy with the lecture course description.

Grades: Students will typically work together in teams of two. Each team will submit a single notebook that is your joint best effort. Your grade for the laboratory will be the average of the grades for the individual labs in your notebook. The basic guidelines for lab notebooks are described in the introduction to the lab manual. Here is how they specifically will apply in this section:

Grades are based on a scale of 0 to 100. A lab write-up that presents data and analysis with no major errors and barely adequate discussion will receive a grade of 80. The grade could go up or down from there. Points will be added for exemplary work and further evidence that you have fully understood what the lab was about. Points will be subtracted for mistakes, omissions, contradictions, or sloppy work. Typically, the average grade for all the labs is about 85.

Specifically, you will be rewarded for:

1. Evidence that you have identified and understood the key physical concepts involved in the experiment.

2. Quality of data taken—within the limits of the apparatus, this reflects the care with which you performed the experiment.

3. Extraordinarily good organization and clarity. Putting data **IN TABLES** often greatly enhances clarity and reduces the amount of writing you have to do.

4. Good discussion of sources of uncertainty, **especially** estimates of the size and relative importance of the uncertainties. *If you think you have made a mistake, redo the measurement or calculation.*

   Note that long lists of possible errors, without any sense of whether or not those errors were actually relevant for *your* experiment, are rarely useful. Don't make such lists. Instead, concentrate on those few factors which you think were most important. Refer to specific data or observations you made supporting your argument.

5. Suggestions for improving the experiment, such as suggestions to clarify the physics, improve the precision, or improve the write-up.

You will lose points for:

1. Missing or contradictory data.

2. Incomplete, unclear, or incorrect analysis.

3. Illegibility. Your notes are of no use if no one else can read or understand them. In some cases, I may return the lab notebook ungraded and require you to re-write it more clearly before I will grade it.

4. Poor writing. While I don't expect a polished final product, I do expect your writing to be in reasonably clear and correct English.

5. Any clear evidence that you do not understand what you have done in the lab.

If you have any questions or complaints about grading, please ask me. I will be happy to discuss your grade and how it is determined.

Please note that most of the experiments are designed to work, and to be easily completed well within the 3-hour lab period. You should usually have plenty of time to give careful thought to what you have done and to explain your thinking clearly. You don't have to write a lot, but what you do write should be clear.

Andrew Dougherty Fall 2017
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Time	**Mon.**	**Tues.**	**Wed.**	**Thurs.**	**Fri.**
8:00 8:30					
9:00 9:30					
10:00 10:30	*prep*		*prep*		*prep*
11:00 11:30	**Phys 111** HSC 100	*Office* *Hour*	**Phys 111** HSC 100		**Phys 111** HSC 100
12:00 12:30		*prep*			*Physics Club*
1:00 1:30	**Phys 111** HSC 100	**Phys 152** **Lab** HSC 142	**Phys 111** HSC 100		**Phys 111** HSC 100
2:00 2:30			*Office* *Hours*		
3:00 3:30	*Office* *Hour*				
4:00 4:30	Department Meeting	Committee Meeting	*Physics Club*	Committee Meeting	