Physics 272, Laboratory for Physics with Calculus II

Sections 4 & 5, Spring 2009

Dr. Yost

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Classes:	221 Grimsley Hall, sec. 4: Tues 15:00 – 16:50 sec. 5: Wed 14:00 – 14:50	**Office Hours:**	Mon Tues Fri 13:30 - 14:30 or by appointment (except Mon Fri AM, all day Wed, and Thurs PM)
Web Page:	www.vic.com/syost/phys272		

Welcome to Dr. Yost's sections of **Physics 272, Laboratory for Physics with Calculus II**! In this laboratory, we will conduct a sequence of laboratory experiments to illustrate the concepts covered in Physics with Calculus II, including thermodynamics, electricity and magnetism, and optics. You will obtain practice in quantitative data analysis and build your skills in scientific writing.

Grades

Your grade will be based on reports that you turn in on each laboratory experiment. Each report will be graded according to how well it communicates your results and your **understanding** of them, including the degree to which your measurements match or do not match theoretical expectations. Each report will be assigned a letter grade based on these considerations, and the average of these grades will be your grade in the course. My impressions of your behavior and procedures in the laboratory may also be a factor in the grade assigned to a report. I will discuss the laboratory with each group before they leave. **You will need to check out** to receive full credit for doing the experiment.

Lab Reports

Every laboratory will require a written report, and these will be the primary basis for your grade. **Electronic submission** to scott.yost@citadel.edu is preferred. The report is due by the beginning of the following laboratory. Reports may also be turned in on paper at the laboratory or placed in a drop box in the physics office. **Notify me if you use the drop box.** If the next laboratory is a Makeup Week, the report must still be turned in electronically or to the deposit box before the normal class time. Late reports will receive a one-grade reduction, unless you have an acceptable excuse. **Late reports more than one week late will not be accepted.** All reports will be graded and returned simultaneously, one week from the due date.

Reports must be prepared electronically, regardless of how they are turned in. The computer-interfaced data acquisition, statistical analysis, and plotting require an electronic presentation to precisely and clearly communicate the results. Hand-written reports or hand-produced graphs are unacceptable, and if presented, will result in severe grade reductions.

While you will work together in the laboratory, at its end, each student will have an individual record of the experiment, and will use this record to write a personal laboratory report. The lab report is absolutely **not** a team or joint project. You should have the same data as your partner, but its interpretation should be your own, and anything written about it must express your own ideas and be in your own words. Although collaborative reports are not considered plagiarism in this course (not an honor violation), they are considered a serious breach of course regulations, and will result in a failing grade for the report.

A report should be complete, but not excessively wordy, and should avoid repetition and overgeneralization. A good report should begin with a standard title page as explained in the laboratory manual, clearly showing your name and who your collaborators were. It should then have the following sections:

1. **Introduction**
   Always begin with a short summary of what your experiment is supposed to demonstrate, in your own words. This may be just a sentence or two, and need not be labeled as a separate section, but could be the opening paragraph of the *Procedure*.

2. **Procedure**
   Give enough detail of the experiment to explain how you did the measurement, and what equipment you used. Anything special you did to make the measurements more precise should be noted here. Any problems should also be noted. Don't just reproduce the lab manual. This should be specific to how you carried out the instructions. When discussing equipment and its use, also estimate how accurately you believe it can

measure the data you are taking. Give a reason for your estimate. Knowing the precision of your measurement is essential to deciding whether or not it agrees with theory. This section should not be pedantically repetitive, but also should not omit any important detail.

3. **Analysis**

   You should reproduce enough data from your tables to allow the reader to see how you came to your conclusion. Include equations necessary to compare your data to theory, and graphs showing how the data and theory compare. Any graphs should be done on the computer. Careful plotting of results is an essential part of interpreting the data, so missing or sloppy graphs will result in a **significant** grade reduction. Unlabeled or improperly labeled graphs will also result in a grade reduction. Axis spacing should be uniform in terms of a measured quantity – linear or logarithmic spacing is acceptable, but random spacings of the sort Microsoft Excel prefers to produce by default are *not*.

4. **Discussion**

   When writing the discussion, be aware that it is impossible to prove anything using an experiment. You can only confirm agreement with a theory within the precision of your experiment. The discussion **must** show how well the results agreed with theoretical predictions. It must say whether the agreement was within reason for your procedures, based on an estimate of the errors in the data you acquired. The sources of the errors should be discussed. If you do not agree with the theory, you should discuss possible reasons, and make suggestions for improving the measurements. Do not neglect this section. A thoughtful discussion can do a lot to boost your grade, even if the experiment didn't work out well.

An "A+" sample lab report from a different course is posted on the web site. It includes all of the elements just discussed. I strongly suggest looking at it, and in particular, noting the quantitative nature of the discussion, which is an essential part of any lab report. When appropriate, statistical analysis may be required, and error propagation should be used as appropriate. Expectations for each experiment may differ, but will be made clear during the laboratory session.

I will normally review your reports with you when I return them. If your grades on laboratory reports are unsatisfactory and you do not understand why, be sure to schedule an appointment to discuss this in detail, and bring your reports to the meeting. If English skills are a problem, you may also wish to contact the Citadel Writing and Learning Center. See their web site, www.citadelwritingandlearning.com .

Missed Laboratories

Missing a laboratory is at least as serious as missing an exam, and should only happen under very special circumstances. **Routine chores such as guard duty are not an excuse** – it is your responsibility to be sure these do not conflict with a laboratory. If you know in advance that you will miss a laboratory, you must make arrangements to make it up in another section of this course – either mine or another instructor's. The laboratory must be made up during a scheduled session in **the same week**, and the report is due at the normal time. If you plan to make up a laboratory in another section, please make a request to the instructor of that section, so that you will be expected.

If you miss a laboratory and are unable to make it up at any session the same week, and have a valid excuse showing that you were not able to attend any session that week, then you may make up the lab during a scheduled Make-up Week by prior arrangement. Do not just come to Make-up week without prior approval, since the experiment may need to be set up in advance.

Schedule

The following topics in the laboratory manual will be covered this semester.

Dates	Experiment	Number
Jan. 13 – 14	No laboratories – Classes start Wednesday	
Jan. 20 – 21	No laboratories – Martin Luther King Day	
Jan. 27 – 28	Measuring Absolute Zero	TH4410
Feb. 3 – 4	Coefficient of Length Expansion	TH4420
Feb. 10 – 11	Heat and Change of Phase or Temperature	TH4430
Feb. 17 – 18	Work Equivalent of Heat	TH4440
Feb. 24 – 25	Temperature Coefficient of Resistance	EM4510
March 3 – 4	No laboratories – Midterm Week (Make-ups only)	
March 10 – 11	Voltage, Current, and Ohm's Law	Handout
March 17 – 18	Charge to Mass Ratio	EM4530
March 24 – 25	No laboratories – Spring Break	
Mar. 31, Apr. 1	Faraday's Law of Induction	EM4570
April 7 – 8	The Index of Refraction	OP4710
April 14 – 15	Paraxial Imaging	OP4720
April 21 – 22	No Laboratories – Make-up Week	
April 28 – 29	No laboratories – Classes end Tuesday	