

PHYSICS 204 LABORATORY

INTRODUCTION

LABORATORY GOALS AND PHILOSOPHY

Physics is an experimental science. Experiments are performed to test the predictions of theories or to present data the theories cannot explain in order to spur better theories.

If you find physics difficult, you are not alone. The concepts are often not easy to grasp. We must each construct our own models of understanding. Passive listening to lectures and rote memorization are not good ways to learn. We must be able to assimilate the concepts and apply them to predict further phenomena. Studies have shown that learning improves when a student thinks about a concept or problem by him/herself first and then discusses it with a small group of peers. That is the philosophy we will follow in this laboratory. The abilities to work within a group of peers and to communicate ideas, both orally and in writing, are important skills to have. These are fundamental goals of this laboratory.

Most of the experiments in this laboratory will utilize data sensors interfaced to a computer. We utilize PASCO's Data Studio software, because of its powerful ability to take data, present it, and analyze it. You will find most of the analysis tools you need in Data Studio. You can find the area, highlight a particular region, find averages, or a host of things with Data Studio. You will find that you will normally be able to fit or model data with an analytic function. We will also make occasional use of Excel. Remember to print out and include any computer results.

PURPOSE OF THE COURSE

The purpose of this laboratory is to

1. teach you some important physical phenomena and concepts,
2. introduce you to proper laboratory procedures, to use computers and data sensors, and teach you some basic laboratory techniques,
3. give you confidence in your ability to take measurements and adequately analyze and interpret data,
4. teach you better oral and written communication skills,
5. teach you to think for yourself and to work in groups of peers.

REGISTRATION

Physics 204 is a dependent course for Physics 202 and 232 (and sometimes 152 or 251), but it is not a part of any of those courses. It is a one-credit course with an independent grade. You should, however, be registered in a lecture course at the same time you are taking this laboratory course. The lecture and lab courses complement each other.

We will block registration in Physics 204 on Friday, January 23, 2009. The labs start on Monday during the semester's first full week of classes (January 26, 2009).

This causes a serious problem in having all students being placed in a lab section before the College drop/add dates. We will send you more information about this later. After Friday, January 23, 2009 morning at 8:00 am, Mr. Larry Suddarth (room 214 – Physics building, 924-6843, lts7x@Virginia.EDU) will be the **only** person who can add you into a section of 204.

You **must** attend the section of your choice on time during the first week of lab. If you attend on time and are registered for that section, your place in that section is secure. If you do not attend or are late to your registered section, your name will be dropped from that section's enrollment.

Let us reemphasize this point: If you are registered for a section and wish to secure your place in that section, you must attend that section on time during the first full week of classes. Labs begin meeting on Monday, January 26, 2009.

After students registered for a section (who show up on time!) have been added to the roster, those who wish to add to that section will then be added if space is available. Since only 24 students may be in any given section, if more students want to add than there is space available, names will be drawn at random and added to the roster until the 24 spaces are filled. The remaining students must find other sections to attend.

In the *extraordinary* event that you cannot attend any sections during that first full week of classes (say due to major illness or a family emergency), please contact Mr. Suddarth as soon as possible, but absolutely before your scheduled section. Contact Mr. Suddarth regarding any problems with registration.

It is your responsibility to be registered for a laboratory section. If you are unable to find a lab section open that meets your schedule, go to a suitable section the first week to see if space becomes available or to see if someone will switch with you. You may need to go to several sections before this is successful.

COURSE ORGANIZATION

Every student must purchase the manual for Physics 204 at the UVa bookstore. This manual contains the laboratory activities which you will use each week. You'll be assessed a 10% penalty each week if you fail to bring your manual to lab.

Your work in Physics 204 will consist of three parts:

1. A prelab homework assignment that you must complete before coming to the lab.
2. The lab itself, answering all the questions and predictions, and attaching data, results, graphs, and analysis as requested with your group members that will be turned in at the end of the lab.
3. A postlab quiz that you must finish in the specified time period.

The labs are overseen by a graduate teaching assistant (commonly called a TA). The TA's responsibilities are to ensure the safety of the students, protect the equipment, provide good teaching pedagogy to help you learn as much as possible, provide additional instructions and information concerning the lab, grade your work and, together with the faculty, assign your grade.

GRADING POLICY

Physics 204 will be graded as follows:

- The prelab homework is worth 20%.
- The weekly lab is worth 50%. Your grade is based on your performance in the laboratory as evidenced by what you turn in each week.
- The postlab quiz is worth 30%.

No scores will be dropped. Lab scores will be curved based on your TA's students only (to take account of the different grading scales of the TA's). Final grades are determined by relative class "rank", not by a predefined numerical scale. Historically, the average grade in 204's predecessors has been almost a B+.

PREPARATION

Before attending your lab section during the first full week of classes, look over the lab manual and become familiar with the appendices to which you should refer as needed throughout the semester. Particularly important is Appendix D: The Accuracy of Measurements and Significant Figures. Refer to Appendix D and apply it appropriately throughout the semester.

For each lab, you must do the prelab homework that can be found on the WebAssign Internet site:

<https://www.webassign.net/uva/login.html>

The login username and password are the same as your UVa email.

We are not having you submit a formal written lab report, but instead, we are requiring you to spend time preparing for the lab each week. We expect that since you are better prepared, the lab will be a better learning experience.

In order to prepare for the lab each week, you should do the following:

1. Read over the lab write-up in this manual (including the relevant appendices) to obtain an overview of the material.
2. Read the instructions again, but this time more carefully; highlighting the important features of the lab. Try to work through any derivations you do not understand (refer to your textbook as needed). In other words, be an active reader and study the manual. Answer all predictions that are supposed to be done before lab. Do not answer any predictions that you are not requested to do before lab.
3. Complete the prelab homework. The homework is not pledged, and you are encouraged to work together to understand and solve the problems. HOWEVER, you are responsible for really knowing how to work the problems. Simply "plugging numbers" into a formula or spreadsheet given to you will teach you nothing. You are often expected to complete the lab predictions as part of the prelab.

PROCEDURE IN THE LAB

Normally you will work in groups of three. You will be assigned to a different group each week. We encourage a free exchange of ideas between group members (and also generally in the laboratory), and we expect you to share both in taking data and in operating the computer system. Your TA will deduct points from your lab grade if you are not participating in the experiment and if you are dominating the experiment. You are not allowed to write in your lab manual before the lab except for the predictions that were requested in the prelab homework or in the lab manual. You must not answer any of the questions in the lab manual before the lab period. You will turn in your lab materials as a group at the end of the period. Everyone must fill out the material asked for in the manual, but you only should turn in one set of graphs and data when you are asked to print them out. Be sure that all such printouts are well noted with the activity number and your lab partners' names. You and your group members will not necessarily receive a common grade for the lab each week, because we will grade both your results and your answers. Each lab is two hours (technically one hour and 50 minutes) long. You are expected to have vacated the room within one hour and 55 minutes to allow the next section to begin on time.

ABSENCES AND TARDINESS

Absences will be excused only for legitimate reasons (illness, a death in your family, a University sponsored trip, etc.). If you must miss a laboratory session, submit a written petition (email will suffice) to your TA explaining your situation and requesting permission to make up the lab. **This request must be made before the lab, not after.** We will not normally allow you to make up a missed lab unless you tell your TA before the scheduled lab period. Unexcused absences earn a grade of zero for that lab.

Late arrival for any lab session is very disruptive and will be penalized. After an initial 5-minute grace period, the TA will deduct 10% from your grade for the first 10 minutes of tardiness and 15% for each successive 10-minute period (or part thereof).

LAB MAKE-UPS

You **must** receive written permission from your TA to make up a missed lab. All make-ups must be arranged by your TA **in advance**. Make-up labs are normally Thursday afternoon in Physics room 212 beginning at 5 PM. You may only make up a lab during the week that you missed it or the following week. The labs are not left set up more than the following week. It is the student's responsibility to make sure the TA has given permission and to attend the make up.

If you miss a lab for an approved reason, and do not make up the lab until the following week, contact Mr. Suddarth for an extension for the prelab homework and the postlab quiz.

WEBASSIGN POLICY

Please pay close attention to the due dates of the WebAssign prelab and postlab assignments.

The prelab homework will always be posted on Tuesday of the week before the regularly scheduled lab. The homework is due 30 minutes before the lab (and no extension other than that described in the make-up policy will be granted).

You will be given several submissions to obtain the correct answer. Do not waste your submissions. Seek assistance if you are having difficulty. Remember, the homework is NOT pledged. Indeed, you are encouraged to work together. As noted earlier, though, you are expected to learn how to do the problem, not just “work the calculator”. Work all your calculations out to several significant figures, at least 6. Submit your answer to WebAssign with at least 4 significant figures. Never round off any of your given numerical values or any intermediate values. Ignore the fact that you may be given a number accurate to only 2 significant figures. Assume it is 10 figures.

The postlab quiz IS pledged. You are allowed to use your book, notes, and manual (available in PDF form via the class website), but you are NOT allowed to consult anyone or use results from any previous year.

The postlab quiz will be posted right after the lab (at the next hour mark). **It is DUE by 5 am of the day after you perform the lab.** The quizzes have a time limit of 45 minutes. To allow for “transit delays” and the like, the time limit set in WebAssign is for 50 minutes, but you must finish the quiz within 45 minutes. This is an absolute deadline and if you do not submit the quiz on time, you will receive a zero. Do NOT “aim” for either deadline. *Never begin your post-lab quiz if you think there is the slightest chance that you will lose electrical power, like from a thunderstorm.*

You will be given three submissions for the postlab quiz to allow you to “save” your work and to reduce the temptation to wait until the last second to hit “Submit”. Unlike the prelab homework, you will not be told whether the answer is correct when you submit the postlab quiz. WebAssign always grades your last submission, so you must leave your answers in WebAssign after each submission. Do not wait until the last second to submit your answers or you may receive a zero. **Despite our warnings this will happen to several students during the semester, and they will receive a zero.**

There is also an option for asking for an automatic extension in WebAssign if you miss the due date for the postlab quiz. You must ask for the automatic extension within 22 hours of the due date. If you accept the extension, 30% of the maximum score will be deducted from your quiz score, and you must complete the quiz within a window of 2 hours that begins when you accept the extension.

Please note this statement from the WebAssign manual concerning the Time Remaining clock on WebAssign:

The first time a student clicks a timed assignment, the Java applet countdown timer will show the number of minutes and seconds left for submitting the assignment. Java must be enabled in the student’s browser to see the countdown timer. A popup window will warn the student when there are 5 minutes, 2 minutes, and 1 minute left. The student’s countdown timer runs independently from Web Assign’s clock. **If a student opens another browser window, the clock may no longer be accurate.**

CLASS POLICY

Although we strive to discuss most situations in this Introduction, the class policy will undoubtedly be changed throughout the semester in some way. Rules and discussion here can be changed by emails sent out to students. A class website will also include changes to the policy described here. You may access the class website through Collab or directly at <http://people.virginia.edu/~jy2b/204/Spring2009/>.