

Physics 19a, Introductory Lab, Fall 2007

Instructor

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Course structure

Each week, you will do one experiment guided by a writeup. You will collect and analyze data, estimate errors and write up a report of your results which will be due at the beginning of the following week's lab.

Purpose of the course

Physics is an experimental science. The theoretical ideas introduced in the your lecture course were discovered or deduced from experiments. Consequently, there are several goals of this course. Among them are

- to demonstrate the theoretical concepts you study in your lecture course
- to teach you good experimental techniques by familiarizing you with experimental apparatus, data collection and data analysis
- what to do about the inevitable random errors that accompany any data collection, that is, introductory error analysis
- how to present your results concisely and clearly in lab reports

Additionally, physics 19 should prepare you for more advanced labs where not as much direction is given as to how to perform an experiment. What is meant by this is the following.

The typical 19a lab writeup will have a series of instructions that guide you through the lab. This is much different than, say, the lab instructions in the Physics 29 lab or the more advanced labs in chemistry and biology. There, you are presented with a problem, a bunch of equipment and told to solve it. Of course, this is the way physics and science is done at the research level. There are no answers in the back of the book, often times because there is no book. One has to figure out, based on the physics behind the problem, what to do.

To prepare you, the students of physics 19 for this culture shock, as you gain experience and confidence in this course, certain steps in the lab will be left out. You are to figure out the missing pieces which if you understand the purpose and goal of the lab and the physics behind it, should present no problem. Of course, the teaching assistants and I are always available to help you with this but you will be encouraged to develop independence.

Lectures

There will be a lab lecture each Monday from 3:40 to 4:30 in Abelson 131. The theoretical ideas used in the labs are reviewed in the lectures, along with a discussion of how to do the lab and why the instructions are as they are. You are responsible for any material I cover so miss the lectures at your own peril.

Lab Sections

The lab sections meet in Kalman 01. You must attend your assigned section unless prior permission to attend another section has been given. Depending on the size of your section, you will work with one, two or, rarely, three lab partners. However, lab reports are not a collaborative effort and must be written individually. Your reports are to be handed in at the beginning of each subsequent lab (Monday, Dec. 3rd for the last lab).

Lab writeups

Lab write ups will be posted on webct the Sunday evening of the lab week. Other material will also be available on webct, such as how to write your lab reports and information on error analysis.

Makeup labs

Excused labs are possible only for medical reasons which must be substantiated, and official sports and similar events or other extenuating circumstances through my prior approval. All missed labs should be made up before the final exam. It is best to make up missed labs the same week by joining another section. Sometimes this is impossible so the week of the 3rd of December is reserved as a makeup week.

Grading

The course grade is determined by three factors:

- Your lab reports which are to be submitted to your TF at the beginning of the following week's lab section
- Short lab quizzes at the beginning of the labs. The number of these quizzes will be between 5 and 8.
- The final exam which will be a one hour exam held the last lecture class of the semester.

Lab reports

Each week you will submit a lab report based on the previous week's lab. The report will summarize your findings. The format you should follow will be posted on webct. Each of these will be graded by your TF and returned to you promptly.

Quizzes

At the beginning of each(some) of the labs, your TF will give a short quiz based upon the lab writeup for that week and any pertinent information I may mention in the lab lecture for that week.

Final Exam

A one hour final exam will be held the last lecture class of the semester, Dec 3rd, at the usual lecture time. I will give a review session the week before that should prepare you for the types of questions I will ask. If you did your own work and understand the physics of each lab, then you should have no trouble with the exam.

How to earn an A+

Your grade in the course will be earned / calculated as follows:

		A+	→	97	–	100
		A	→	93	–	96
		A-	→	90	–	92
		B+	→	87	–	89
		B	→	83	–	86
		B-	→	80	–	82
		C+	→	77	–	79
		C	→	73	–	76
		C-	→	70	–	72
		D	→	60	–	69
		F	→	0	–	59
lab reports	60%					
lab quizzes	20%					
final exam	20%					

I generally curve to a high B+.

If lab reports are handed in late, then a grade of 50% will be given if submitted within one week of the due date. After that, a grade of 0% will be given. You must take the final, do each lab and turn in a lab report for each lab to pass the course. Otherwise, you will get a failing grade.

What mathematics you should know

You are expected to know calculus, in particular, how to take derivatives and integrate simple functions. You should also know how to approximate the derivative of a function at a point by taking the ratio of the difference of function

values to the difference of argument values, how to approximate a definite integral by a sum, understand how the derivative is related to the change in a function and have some familiarity with partial derivatives (Do not worry if you do not yet know what a partial derivative is. It is not a difficult concept and I will talk about them in class.) Finally, you should know some simple vector algebra such as how to add and subtract vectors and find vector components. In other words, you should know what you are expected to know for physics 11.

Software

We will use Excel for data analysis and reporting. Other software used is Logger Pro, Virtual Dub and Tracker depending on the experiment and the means of data acquisition.

Your data files

At the end of each lab period, put your data files on a cd or dvd (you bring one in) or upload to your web site. Then please delete all your files on the lab computers.

Religious Holidays

Because of the religious holidays, some labs have to run over a two week period. For those instances, there will be no lab lecture the second week of the lab.

A final note

For those of you in the evening lab sections, some of the doors to the building may be locked. What is open is the door to Kalman underneath the overpass. This is the door that when you enter, on your left are the vending machines and to the right is the physics lab at the end of the hall.