SUNY Geneseo
Department of Physics and Astronomy
Class: T 2:30pm in Greene 231
Web: http://www.geneseo.edu/~pogo/

Dr. Pogo
Office: Greene 232
Office Hours: MW 2:30-4:00pm; W 10:30-11:30am
E-mail: pogo@geneseo.edu

Analytical Physics I Laboratory

(Phys 124-06)

Fall 2006

What am I doing here? In this course *we will be doing experiments* to examine the physical world around us. The emphasis here is threefold:

1) To understand the *methods* (including equipment, mathematics, limitations, and philosophy) that we use to investigate the physical world.
2) To *reinforce the concepts* discussed in Analytical Physics I.
3) To learn to *communicate* the above two items clearly and succinctly.

In this lab, "getting the right answers" is not your highest priority.

I Can't Visualize the Experiments! While you're reading the lab manual (a few days before lab actually meets), you might want to examine some pictures of the experiment on-line, to help you get a feel for how big stuff is, etc. On the web, go to **http://www.geneseo.edu/~pogo/Analyt1Labs/p124home.htm**, and from there, you can go to a different web page for most of the labs that we'll do this semester.

Grading Policy: Throughout the semester you will complete eight experiments; some will take more than one week to complete. You will be expected to write-up some form of analysis of your data for *every* experiment you do. Although experiments are performed as teams, each student is required to submit his or her own unique report. The requirements for the report will vary from week to week, but will often be in the form of an *abstract* (see page 7 of your lab manual). You will also be required to generate and submit plots for many of your experiments. Each report will be due at the *beginning* of lab the following week. Late work will be penalized 20% per day.

For any of you who will become professional scientists (whether in physics, chemistry, biology, engineering, etc.), you will learn that your professional recognition (and salary) are based to a large degree on how well you can communicate the work you do. As a result, the grade for each abstract will be based on your decisions about what to include and exclude, clarity and brevity, and your grammar and spelling. Writing a good abstract is extremely difficult, and will require a significant investment of time each week. Good abstracts require revision over time, and cannot be written in a single session.

When abstracts are required, you will be required to submit a *first draft* of your abstract within two days of doing the lab (Thursday at 5:00pm). The purpose of the draft is to force you to write in multiple sessions. You will *not* be given feedback on it. This draft may contain spelling errors, and will probably be significantly longer than your final version. Your final version will be graded on your effort more than your numerical results.

Every week, you will be given a quiz at the beginning of the lab period. A quiz will generally be designed to make sure that you have read *and understood* the appropriate section of the lab manual *before* coming to lab. Quizzes will usually require you to recall and apply the necessary equations to solve problems similar to those that will confront you in the lab.

Your lab grade for the semester will be based on the following:

Weekly Quizzes		= 25%
Weekly Reports/Abstracts		= 50%
Lab Notebook	(see page 6 of the lab manual)	= 15%
Lab Participation	(tardiness, effort, neatness, etc.)	= 10%
Total		= 100%

A Few Tips on Writing Abstracts

An abstract is a *short summary* of the things that you did during the experiment.

- As far as the abstract is concerned, the lab manual doesn't exist. You may not *implicitly* or *explicitly* refer to the lab manual. Pretend that you are writing for someone who has never done or even heard about the experiment.
- Shorter is better. Reread your abstract a day after it has been written. If the abstract is just as clear without any particular word or sentence, remove it. The presence of useless text is the greatest problem in most abstracts. In general, as an abstract gets longer, the grade will get lower.
- Use the past tense.
- Avoid superfluous phrases such as "To do this…," or "In this lab…," or "To get started…," etc.

You should read the sample abstract for the Hooke's Law experiment, and review it every week before writing your own abstract. Without exception, good writing occurs in drafts. You should write your abstract the day after lab, and re-read it and correct it a day or two after that. There is absolutely no excuse for spelling or grammatical errors. Finally, you *must* have someone else proofread it. This should be someone who has never participated in this lab; that way, your proofreader can check not only grammar, but can also tell you whether your writing even makes sense to a non-specialist. If, after reading your abstract, your proofreader can't tell you what it all means, then you have some changes to make.

There is no exact "formula" for writing good abstracts. However, most abstracts include:

- **A statement of purpose**. Approach the labs as though they have never been done before, by anyone. In an abstract, your purpose is *never* "so we could learn about force". Instead, your purpose is usually to measure a certain quantity, or perhaps to verify a theory.
- **A brief description of the experimental technique**, equipment, and procedure used. Writing this so that it is both correct and brief is extremely difficult.
- **A discussion of the analysis you performed**, especially the methods used.
- **A *summary* of the important results**, including numerical values for your uncertainty.
- **Conclusions**. Was the *statement of purpose* (see above) fulfilled? You may not use any sentence similar to: "This lab was successful". You should identify the largest source of uncertainty. The ever-present "human error" is never acceptable; if you make a blatant error in measurement, you are required to repeat the measurement.

Abstracts never include equations, plots, or other figures.

Making Plots

Often, you'll be required to submit a printout of a plot of your data. All plots should be professional in appearance, and include:

- A name.
- Clearly labeled axes. The labels should include the appropriate units.
- A white background. Note that Excel usually creates plots with a gray background.
- A legend, *if* there is more than one set of data shown. Legends are not desired if there is only one set of data. In any case, "series 1" is *never* an acceptable legend.
- Any symbols used should be the correct ones. Note that in some circumstances, Excel will automatically label the axes for you, incorrectly (e.g., the horizontal axis is almost never "*x*").

Answering Questions

Sometimes, your weekly report will be in the form of answers to specific questions, as opposed to an abstract. Questions must be answered using complete sentences, and your "answer" must make it clear to the reader (me) what the question is. For example, suppose you are asked:

> When measuring the location of each dot in a series printed on a paper tape, is it better to record the positions of the dots relative to some fixed origin on the tape, or the distance between neighboring points?

Your answer should be something like this:

> When measuring the location of each dot in a series printed on a paper tape, it is preferable to measure the position of each dot relative to a fixed origin on the tape, as opposed to measuring the distance between neighboring points. This prevents any errors made while measuring the positions of the earlier dots from affecting the results of the later measurements.

Besides one word answers, errors in answering questions frequently arise from answering a different question than has been asked!