Physics 233 Lab

Lab Reports

At the end of the experiment, each group will turn in a lab report. The goal of the lab report is to communicate the question you were trying to answer, your reasoning for what you chose to measure, the exact procedures used to collect your measurements, the data you collected, and what conclusions you drew from the data. Each report must contain the following sections:

- Abstract
- Introduction
- Materials and Methods
- Data Analysis
- Evaluation

Listed below is a short explanation of each section, and some questions you should aim to answer in the corresponding section.

Abstract

This is a short (one paragraph) summary of the entire lab including its purpose, what you measured, and what you concluded.

- Did you introduce the question you're trying to answer?
- Did you explain what data you would collect in order to answer the question?
- Did you quote your results?
- Did you state your conclusion based on your results?

Introduction

This is where you explain the experiment you *plan* on doing. A common mistake that students make is summarizing the whole lab i.e. what they *already did* in the introduction. The purpose of the introduction is to give context to the procedures and data analysis that you include in later sections of the lab report.

- What question are you trying to answer?
- How do you plan to answer the question?
- What data will you collect?
- How will that data help you answer the question?
- Do you expect to see a certain result?

Materials and Methods

This section describes what you actually did in the experiment. This is the most important section of the lab report. Each lab has procedures/instructions that you should follow. This sections tells us (the TAs) how well you followed those instructions. If you had to make a decision to do one thing over another, it's a good idea to explain your reasoning in this section. This is also where you describe how you used any equipment or used any software.

- How **exactly** did you collect the data?
- What software/equipment did you use?
- If you had to calibrate your software/equipment, what settings did you use?
- Did you collect data once? Did you collect data several times and average the results?
- Did you use your measurements directly, or did you perform calculations on the measurements to obtain other quantities? How did you do those calculations?

Data Analysis

This section is where you report the measurements that you collected, as well as describe any analysis you did. Suppose you collected 10 measurements, but decided to throw out 3 of them. What was your criteria for deciding which measurements to throw out? Do you still have enough data to draw a reasonable conclusion? If you had to perform a linear regression or fit a line to your data, how good was the fit (what is the R^2 value)? Did you fit all of your data with one line, or do you get a better fit by fitting only a certain portion of the data? It's always a good idea to give justifications for your decisions and back them up with data. On the other hand, don't include every single piece of data that you collect. Only include the data that's necessary to back up any claims that you make (unless we specifically ask you to include something).

- Did you include relevant data?
- Did you explain any charts, tables, images, etc that you included?
- Did you explain your interpretation of the data?
- Does your data make sense? If other groups collected the same data, did your data match theirs?
- If there are anomalies in your data, what happened? How do you know that these are anomalies?
- What conclusions can you draw from your data?

Evaluation

The purpose of the evaluation is to look back on the experiment that you did and critically evaluate it. This is not simply a summary of what you did in the lab. Did your results match up with what you expected to see? If not, what could have happened? Discuss any possible sources of error. Note that "user error" is not sufficient. If you claim that there was error in how precisely you were able to track an object in ImageJ,

think about how much error that could really introduce. If you were off by a few pixels, would that really account for your results being off by a factor of 10? Did your data look similar to other groups?

- If you expected a particular result, did you get that result?
- Is there anything that you would do differently if you had to do the experiment again?
- What were some possible sources of error?

Procedures and Grading

Your lab reports will be handed in at the end of class at the end of each lab (roughly every 2-3 weeks). Your lab reports will be graded and handed back to you typically within 1-2 weeks of them being handed in. Each lab report is graded out of 30 points according to the following rubric:

- General (3)
- Abstract (4)
- Introduction (6)
- Materials and Methods (7)
- Data Analysis (6)
- Evaluation (4)

The "General" category starts out at full credit, but points will be deducted from it for poor grammar, spelling mistakes, weird formatting, etc. Note that each mistake won't subtract a point from this category, but represents a holistic view of the professionalism of the report.

At the end of each lab session, all members of the group should be given a copy of the data. This is for your own benefit.

Reports must be printed and submitted to your TA at the end of the last lab session for that lab e.g. the lab report for lab 2 must be submitted by the end of the last week of lab 2.