Physics 411/511 Laboratory Report Format

The primary goal of the laboratory report is to make a stand-alone document. You should be able to read and understand your lab reports without any other resources. Break each lab into relevant sections containing similar conceptual material. The lab handouts provide a nice structure here, but make the report your own by connecting the fundamental ideas that you've made by performing the experiments and theoretical analysis. An outline for how to approach each of the similar sections of your lab write-up is shown below.

Introduction

Provide introductory discussion of what you are studying. What are you going to measure? What can you learn from making these measurements? To obtain nice flow in the introduction it is often better to discuss broad concepts first and then narrow the focus to specific phenomenon. A couple of sentences is sufficient here.

Example Section Introduction:
Currently RC components are important in modern filter design, and AC-coupling devices. To analyze resonant RC circuit behavior we performed time-domain analysis and measured the $1/e$ decay time while discharging a capacitor, and the $(1 - 1/e)$ rise time while charging a capacitor. Our results below verify theory predicted by Kirchoff's loop method to within an accuracy of $\pm xxx$.

Circuit Diagrams

a) Make a circuit diagram showing your experimental setup. You may hand draw your circuit diagrams, or find some program to use. If you find a new circuit drawing program please let the rest of the class know about it.

b) Label each circuit diagram components with symbols/variables, and label each component with it's measured numeric value of resistance, capacitance, or inductance to the side of the circuit diagram so the reader can understand your experimental setup quickly and easily.

c) Here you can also mention specific measuring techniques and general experimental designs of your work.

Equations

a) Write any relevant equations used for theoretical models, preferably using an equation editor in whichever text-editor you're using. It's nice to use the same symbols that were used in the circuit diagram so the reader can follow your work quickly. Discuss any theoretical analysis you've performed.

b) Theoretical results are often required, but do not overwhelm the reader with too much algebra. This is an upper-division course so remember your audience. For example, you don't need to show us how to solve an algebraic equation for a particular variable. The key here is organization and efficiency. If you've labeled everything well, and present enough relevant information, then the mathematics in the report should be easy to follow by any member of the class.

Graphing and Data

a) Include all graphs and relevant data for experiment. Make sure to label the graphs with an informative title, and show the data regions where interesting behavior occurs.

b) Make all of the labels on the axes clear and include units.

c) If you are going to include data tables in the report a nice place to put them is to the side of the graph. You may also include data tables in an appendix.

d) Include any error analysis performed.

Conclusion and Discussion

a) What did you learn? Was there anything unexpected? What is the general behavior of your circuit in the experiment? How do your results compare to theory? Summarize the key concepts.

b) Please include any experimental work you did that wasn't in the lab handout. We highly encourage creative experiments and ideas that are different from the assigned work!

Pitfalls, and things to watch out for

a) Do not write a personal diary about your experiments. Make sure that your focus is on presenting professional quality scientific work by discussing the physical concepts you've explored. Again, the focus should be on creating a stand-alone document. If the reader needs to have additional documentation, then the report is not clear enough.

b) Do not try to hide your data if you think it is incorrect. Mistakes here include making graphs that are labelled vaguely, and not discussing results because they do not support theory. Make your best attempt to present all material in an honest forthcoming manner, and try to explain any measured discrepancies with theory.

c) The number of words has nothing to do with the quality of content. Make sure that you are thoughtful and efficient while presenting material related to each section of each lab.

d) Do not wait until the last minute to write your report, because you may run into any number of problems that require instructor or lab partner assistance. Try to continually work on updating your lab report layout every day with short notes in your lab notebook.

e) All reports should be typed using the text editor of your choice. (Word, Open Office, LaTeX...) Make an effort to present the material in a clear and organized fashion.