

Welcome to my Physics Phy 161 laboratory course. We will concentrate on Electromagnetism which includes optics as topics this term.

PLEASE READ and STUDY These notes which are designed to present my course and help you organize yourself. If you are not sure of something please talk to me about it.

(NOTE: its not surprising to learn that successful students always READ everything given to them, COME to CLASS and DO their Assignments)

TEXTBOOKS

Lecture:

1. Giancoli: Physics for Scientists and Engineers with Modern Physics VOL II 4th ed with the Mastering Physics Student Access kit
2. Laboratory textbook: Physics Lab Manual
3. Free , print only the experiment needed for the day and bring it to class you will not be allowed to print the experiment in the class.
4. Highly Recommended -Schaums's Outlines: Physics for Engineering and Science -to learn problem solving skills- Numerous solved problems

The Laboratory course: If you are in my laboratory section, there is a final exam (open book), 50% of your grade, preparation assignment (GIVEN IN THE PREVIOUS SESSION) due the day the experiment is done, 15% of your grade, laboratory reports on each experiment, 35% of your grade, some extra credit possibilities to 5 points on your final average. Be sure to do the preparation assignments on time since they are due the moment you walk into the lab, thereafter, they have **NO** value and the total average will represent 15% of your grade, so keep that in mind! In a lot of the experiments the laboratory class topics will be behind or separate from the lecture class. Thus, to be prepared make sure you read the assignments as specified in the preparation assignment as well as hand them in with all questions answered with calculations if needed. Preparation assignments also **will include assigned problems** for you to do at the end of the laboratory report you hand in.

Not doing the assigned end problems in a report will result in a significant grade reduction since it demonstrates to me you have not mastered the material you are responsible for.

Laboratory Reports: (35% of your grade)

On Writing Lab reports. First ignore most of the material in the beginning of the lab manual on writing lab reports (I wrote it many years ago), except for error analysis.

I expect you read the following web material on writing a report since **it is the format discussed** there that **all your reports** should follow.

<http://www.union.edu/Resources/Academic/writing/Help/Faculty/Orzel/GuideToWritingLabReports.php>

IE. The areas discussed in detail at the above link are summarized as follows (BE SURE TO READ THE DETAILS FROM THE ABOVE LINK). Also add the error analysis discussed below and any assigned problems at the end of the lab (see online assignments for these.)

A formal lab report is essentially a scaled-down version of a scientific paper, reporting on the results of an experiment that you and your lab partner(s) have carried out. As such, the key sections of the report are directly analogous to the sections of a formal scientific paper. In the order in which they appear, these are the following:

No more than 2 partners to a report unless specified by me. Your partner should be specified on the report but reports should not be copied. Do your own work.

1. Abstract

The abstract is a single short paragraph stating the important results of your experiment, including the numerical values, with appropriate units and uncertainties, and the most important conclusions drawn from the experiment.

2. Introduction

The Introduction gives the important background for understanding the experiment, including both the motivation for making the measurement and a complete description of the theory underlying the measurement, with all the **relevant equations**.

3. Procedure

The Procedure section gives a complete description of the important measurements you made, and how you made them. It is a description of what you did, and is not to be written in the style of instructions to someone else.

4. Results The Results section presents the important experimental findings, including figures and tables containing the data you collected, and text explaining the significance of the results. The Results section is not merely a collection of data tables and figures, but must include prose paragraphs as well. All relevant calculations are in this section and should be shown. **Tables** are a must for showing data obtained as well as comparisons to expected or known values, ie **percent differences or errors**.

5. Discussion and Conclusions

The Conclusion of the report explains the conclusions that you can draw from your measurements--whether they agree with theoretical predictions, what they mean for applications of the central physics principles, and what further experiments are suggested by your findings

6. Answer to laboratory questions from the Manual most labs contain questions to be answered and sometime these are calculation questions which should be answered in 4 above ie Results.

7. Solutions to physics problems found in the preparation assignments. The library tutoring service should have a Physics tutors available also and some of our graduate students will be available to help you also

HAND IN PROBLEMS FORMAT

1. DONE IN PENCIL ONLY, staple multiple pages

2. DEFINE KNOWN VARIABLES use units EGs $v_0=78\text{m/sec}$ $v=100\text{m/sec}$ $x=10\text{ m}$

3 show unknown for eg $a=?\text{ m/s}^2$

4. Show formula(s) used to get unknown(s) $v^2=v_0^2+2ax$

5. Solve algebraically for the unknown $a=(v^2-v_0^2)/2x$

6. Plug in numbers. Show this ! Then use calculator

$a=(100^2-78^2)/(2*10)$

7. Give answer with units $a=196\text{m/s}^2$

%ERROR or %Difference conveniently in the Tables.

Finally in this last section should be your error analysis. For example comparing your measured result (M) with a known value or predicted value (K) Use the formula

For the % error or % difference with these two values = $(K-M)/K \times 100$

It can be negative or positive depending whether M is greater or less than K.

Try to answer why the error or difference. See also the types of errors discussed in the beginning of the lab manual.

Example Table I: note units are in the titles of the columns!

Measurement of Acceleration of Gravity (known as $g=9.80 \text{ m/s}^2$)

Measured Values (m/s^2)	Percent Error (%)	Uncertainty (%)**
9.51	29.0	+/- .3%
9.98	- 18.0*	+/- .3%

*- sign indicates value is greater than known based on formula above.

** Percent uncertainty in the measured value if known. See your Physics textbook for how to estimate this (I)

Example Table II

Values of Resistors (ohms)

Measured Values (M) (ohms)	Calculated Values (C) (ohms)	Percent difference(%) $(M-C)/Cx100$
102	99	3.0
109	112	-2.7

Here Measured means using an instrument to get the value

Calculated means using a formula

For those of you who need help to be successful in college I present the following information:

SKILLS TO BE SUCCESSFUL ARE "**READING COMPREHENSION**" AND "**TIME MANAGEMENT**" to improve your skills check out the following links: Some of you have busy lives and learning "time management" can mean successful performance in school and in industry. See:

<http://csivc.csi.cuny.edu/supernova7/files/reading.htm>

HOW TO STUDY PHYSICS, SCIENCE AND HOW TO WRITE A PAPER:

"How to Study Physics"; There are many references online, try the following:

<http://www.oberlin.edu/physics/dstyer/StudyTips.html>

See How to write an effective college level paper in the next link which might be useful to you in the laboratory reports and other college work.

"<http://csivc.csi.cuny.edu/supernova7/files/howtowritepaper.html>"

IN SUMMARY, PHYSICS IS A PROBLEM ORIENTED COURSE THAT improves your mathematical PROBLEM SOLVING skills as well as increasing your abilities at critical thinking. These skills are necessary for success in Engineering, all sciences and medicine. They are also very useful if you change your field of endeavor.

In other words, workout and study a lot of problems, even more than are assigned. You will gain in the end. Years from now you may forget the particulars but you have opened new channels in your brain that stay with you. Analogous, to building muscles, you may not remember what weights you used but the results of hard work, clearly show!

Laboratory reports as any report can be time consuming to create. We meet 2 hrs a week consider yourself lucky if you can write an excellent report under 4 hours.

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Office hours, normally club hours unless I have a meeting. So be sure to let me know you want to come!

The library tutoring service should have a Physics tutor available also.