

Physics 405 Syllabus - Summer 2008

Instructor:

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Scheduling:

The lab will be open from 9 AM - 4 PM Monday through Friday, from Wednesday, June 4, through Friday, July 18 (excluding Friday, July 4, when the university is closed). You will most likely need Allen or Tommy to open the lab for you. If you are the last person to leave one of the lab rooms, please close the door.

Since we only have a single apparatus for each experiment, you must sign up for time slots for any given experiment. The signup is available on the web at <http://www.physics.umd.edu/cgi-script/courses/p405.pl>. Time slots are available in half-day slots. If you want to leave apparatus set-up, you will need to sign up for consecutive time slots and leave a note on the equipment if the slots are separated by a night. When you have finished, please dismantle any apparatus you have set up.

Due to the limited time and apparatus, you may sign up for only two days each on any apparatus. If, at the end of those days, you find that you need more time, and there are still slots left, then you may sign up for another day.

Lectures:

There will be two lectures a week, Mondays and Wednesdays at 10 AM, in Physics 3112. In the early part of the term these will focus on aspects of error analysis and, possibly, on some aspects of the experiments. At the end of the term, these times will be used for student presentations.

Attendance at all lectures is mandatory.

Texts and Materials:

Physics 405 Laboratory Manual - Department of Physics, Spring 2007 edition
This is only available electronically. It can be found at <http://www.physics.umd.edu/courses/Phys405/Manual2008>

One of the following:

Data Reduction and Error Analysis for the Physical Sciences - Phillip R. Bevington and D. Keith Robinson (McGraw Hill, Inc., 2003, ISBN 0-07-247227-8)

An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurement

- John R. Taylor (University Science Books, 1997, ISBN 0-935702-75-X)

In addition, you will need *two* lab notebooks. It is necessary to have two so that you always have one you can work in, even while one is being graded. Notebooks should be 8.5" x 11" or larger, be bound (either spiral or book-binding), and have numbered, quad-ruled pages. Pages should not be perforated.

Experiments:

Each of the experiments in Physics 405 consists of 1 or 2 units of work. To pass the class, you must complete 6 units. Completion of an experiment is defined as performing the lab and turning in a lab notebook to be graded. You are to complete all of the work by yourself although you are allowed, and may find it useful, to discuss the experiments with other students who have completed them.

Your first experiment must be a one-unit experiment. This means that you must complete at least one other one-unit experiment. Your other four units may include zero, one, or two two-unit experiment.

Pre-lab Questions:

For each experiment there is a set of pre-lab questions in the manual. These will generally be straightforward once you have read through the writeup. These questions must be completed in your laboratory notebooks and checked by me before you start work on an experiment. Whomever opens the lab for you will check to see that these have been completed and signed off on. If they have not, you will not be allowed into the lab.

Notebook Reports:

For each unit of work you complete, you must turn in a notebook report. The form of this report is discussed in the lab manual, and some notes on the grading of this report are included below. These are not intended to be full, formal reports.

Notebooks will be due each Monday at the start of lecture. (Notebook report 2 is due Monday, June 23.) This means that you will need to keep up a pace of about a unit each week. It is *strongly* suggested that you submit your notebook for each unit as soon as you are done the work for it, rather than waiting for the due date, as this will allow you to get your notebook back more quickly.

Formal Report:

One of the 4 to 6 experiments you perform must be written up in a formal report *in addition* to the notebook report. The laboratory manual describes the format and content of the formal report. This report will be due on Monday, July 14, which means that you will not be able to write it on your last experiment. This scheduling has been chosen to allow you time to revise your report and resubmit it by July 25. This revision and resubmission is entirely optional. However, if you choose to do it, your grade for

the formal report will reflect only the better of the two versions.

Oral Presentations:

During the final week of the term, every student will present a 12-minute talk on either one of the experiments performed over the course of this class or on independent original research performed by the student. These talks will be followed by question from the instructor and other students.

Grades:

Your grade in Physics 405 depends on three items. The notebook reports make up 60% of your grade. In assigning this portion of the grade I will be looking both at the quality of your notebook and at improvement over the course of the term. The single full report comprises 20% of your grade. And, the presentation accounts for the final 20%.

Valid Excuses:

If you have a valid excuse for missing a due date for a notebook report or a 12 minute talk (e.g., you will be having an operation) see me to make alternate arrangements, beforehand if at all possible. Ex post facto (after the fact) excuses will require validation and may not be acceptable. You *must* speak to me.

Academic Dishonesty:

Academic dishonesty is a serious offense that may result in suspension or expulsion from the university. In addition to any other action taken, the normal sanction is a grade of “XF”, denoting “failure due to academic dishonesty,” and will normally be recorded on the transcript of the offending student. Remember, you are required to perform all experiments, analysis, and write-up by yourself. It is OK to discuss the experiments with other students but *you* must do the work.

Tips for Doing Well:

Don't fall behind. Don't wait until the last day to do an experiment.

Read the lab manual carefully before attempting an experiment.

Answer the preparatory questions in your notebook and have them checked by me before you begin the experiment.

Keep a complete log for the experiment including experimental diagrams of measurement configurations actually used to obtain data, results, estimates of various errors and limitations to the measurements, analysis used to obtain final results and a proper estimate of all errors including systematic errors as well as statistical errors.

Show clearly the reasoning that you used to arrive at various conclusions. If your experimental result does not agree with the known or accepted values, your reasoning may be

the only clue that I have as to where you, or the experimental apparatus, went wrong.

Additional information, a list of experiments, and more detailed help can be found at <http://www.physics.umd.edu/courses/Phys405/Boyd/hints.html>. Please note that experiment VIII has been discontinued since these notes were written.

Grading of Notebooks:

Your lab notebook should give a complete description of how you did your experiment and how you analyzed your data. Another person should be able to take your notebook and duplicate your experiment.

For the notebook reports you must do the following:

1. Write in a real lab notebook: notebook should be quad ruled, with numbered pages.
2. Write in ink. If you make a mistake, draw one line through it - don't erase it, scratch over it, or use white-out.
3. Staple/paste/tape all graphs and analysis in notebook. Label axes. Include any formulas, derivations, etc. needed to understand your graph.
4. Give a brief description of theory behind experiment.
5. Provide the actual circuit diagram you used to do the experiment.
6. Provide a clear description of the procedure used to take data.
7. Provide the units of all numbers.
8. Provide and explain your estimate of the random and systematic errors in all important quantities effecting your final result. Must use proper error analysis techniques.
9. Pay attention to significant figures.
10. Analyze your data. Write down the methods you used. If you use Mathematica, do not simply paste your Mathematica notebook into your lab notebook - write down in your lab notebook your analysis steps. Compare statistical error with random error (reduced χ^2). Discuss.
11. Quote your results with final total error (including systematic errors).
12. When appropriate, compare your answer to the expected value and discuss discrepancies.
13. Be sure you have answered all the questions asked for in the lab manual, including

discussion questions at end of unit.

14. Be sure you have done all the parts of the experiments that you were asked to do.

General Grading Scheme for lab reports per unit:

Description of procedure (including prep questions): 3 pts

Raw data (including tables, plots, etc.): 5 pts

Analysis (including errors and final results): 8 pts

Everything else on above list: 4 pts

Late reports: -2 pts /day

No notebook for one lab: F for the course!

Other Useful Links:

Guide for using the MAESTRO software: <http://www.glue.umd.edu/~sgranor/405/MAESTROguide-v3.pdf>