

Syllabus for PHYS 313

Intermediate (Junior) Laboratory

PS 133, Time TBA

PHYS 313 - Junior Laboratory. Prerequisites: PHYS 211/212, PHYS 213/214.

INSTRUCTOR: Mr. Martin Hackworth (Martin), Senior Lecturer & Lab Supervisor

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MATERIALS: *An Introduction to Error Analysis*, by John R. Taylor, Lab notebook (Roaring Spring® Brand Computational Notebook, #77-648), Microcal Origin® software (provided by the department).

OBJECTIVES: To acquaint students with intermediate laboratory techniques, self-sufficiency. To introduce students to proper techniques in experimental measurements and statistical analysis. To measure fundamental constants.

COURSE REQUIREMENTS:

1. Complete four experiments *without collaboration* beyond your lab partner.
2. Develop one short paper on experimental statistics.
2. Keep a detailed laboratory notebook.
3. Complete a formal laboratory report for each experiment.

GRADING: Your grade will be computed from the following sources:

- Graded lab reports
- Experimental Statistics Paper
- Lab notebook
- Final Exam

LABORATORY NOTEBOOK

Your lab notebook should consist of $11\frac{3}{4} \times 9\frac{1}{4}$, 4 × 4 quad engineering paper without carbons, with numbered pages, in a permanent binding (Roaring Spring® Brand Computational Notebook, #77-648). Space should be reserved on the first three pages for an index.

A lab notebook is a journal of what you do in this lab. Your lab notebook is to be used only for this course. You are to write your observations and measurements in a legible manner, in ink, directly into your lab notebook without recopying. Mistakes in an experiment are part of the game. You should never erase or recopy lab notes, or tear pages out of your lab notebook, or make an entry in your lab notebook prior to beginning an experiment. All of the material in your lab notebook should be original (i.e., no photocopies, paste-ups, etc., or copying directly from anywhere else) and should pertain directly to what you have done in each experiment. You are not permitted to use anyone else's lab notebook (or data) in preparing your own.

LAB FINAL

A comprehensive lab final is given at the end of the semester. At the discretion of the instructor this final may be waived in recognition of excellence on all prior work or a fifth experiment (with negotiable reporting requirements) substituted for the final.

LAB REPORTS

Unless otherwise instructed, all lab reports should consist of the following, each section beginning on a new page:

Title page

- Name
- Partner's name
- Title of experiment
- Date due/date performed

Abstract (very short - 1 or two paragraphs)

- Purpose and brief general description of the experiment

Theory section

- Physics theory must be relevant - but no need to completely reinvent the wheel.

Procedure

- Tell what you did, not what someone else did or suggested, and why.
- Include sketch/schematics where necessary

Data tables and graphs

- Neat and complete
- Statistically valid

Sample calculations

- Must be neatly done
- Sufficient to follow your work
- Show propagation of error

Discussion of errors

- Must be realistic
- Show % error (where appropriate)
- Show % variation (where appropriate)
- Discuss propagation of error

Results and conclusions

- Did you measure what you set out to measure within reasonable accuracy? Why or why not?
- Discuss statistical methods that lead you to your conclusions.

Avoid plagiarism. Include a reference page if necessary. If you are unsure of what constitutes plagiarism I suggest that you look it up in your student handbook and/or contact me. Any clear style of writing that is grammatically correct is acceptable but the style should be formal and professional.

EXPERIMENTAL STATISTICS PAPER

You are to generate a paper on the treatment of experimental statistics, based on *An Introduction to Error Analysis*, by John R. Taylor, of no less than 1500 words. This paper should convince the reader that you understand the statistical treatment of experimental data and propagation of error and include examples.