

Syllabus for PHY251

Spring 2014

LABORATORY REQUIREMENTS

- Text: The laboratory course pack is Physics 251 (Spring 2014). It can be purchased only at the Spartan bookstore (in the International center, on campus).
- Calculator: Trigonometric and logarithmic functions are required. Statistics functions are not required.
- PHY 251 on the Web : <http://www.pa.msu.edu/courses/PHY251>
- Cell Phones are not allowed in class.
- Write with a pen, not pencils and erasers: eraser crumbs destroy computer keyboards.
- No food or drinks are allowed in the laboratory.

SCHEDULE

Laboratories begin on Jan 6, first week of classes

Week	Starting	Experiment	Video Link
1	6 Jan	Course Introduction	none
2	13 Jan	(1) Intro to Computers & Uncertainties	video
3	20 Jan	No Labs: MLK makeups 5:10pm W&Th	
4	27 Jan	(2) Reaction Time	video
5	3 Feb	(3) Free Fall (measuring g)	video
6	10 Feb	(4) Newton's 2 nd Law	video
7	17 Feb	(5) Inelastic Collisions	video
8	24 Feb	(6) Elastic Collisions	video
9	3 Mar	No Labs: Spring Break	
10	10 Mar	(7) Heat Equivalent of Mechanical Energy	video
11	17 Mar	Practical Lab (TBD)	
12	24 Mar	(8) Moment of Inertia	video
13	31 Mar	(9) The Pendulum	video
14	7 Apr	(10) The Spring	video
15	14 Apr	(11) Waves	video
16	21 Apr	Practical Lab (TBD)	

The purpose of this course is for you to learn how to make measurements of physical quantities, and how to analyze and interpret them, and how to communicate your results. Working in groups of two, you will make measurements, tabulate and graph your data, evaluate uncertainties in your measurements, analyze the results of your experiments, comment on your graphs, and answer the questions given in the laboratory manual. Two of these experiments will be practical labs in which you will work alone. You will change to a new lab partner each week. This will ensure your grade reflects your own effort, and gives you an opportunity to become familiar with computer usage, better preparing you for the practical labs.

PREPARATION FOR THE LAB SESSIONS

Don't skip the first class meeting! We will go over techniques you need to use all semester in your data analysis. You will find it very helpful to prepare well for each lab, i.e. read and study the materials in the lab manual and also view the brief video *before you come to class*. Note: the video is a brief introduction and lets you see the actual apparatus, but doesn't substitute for reading the lab writeup: where they differ, the lab writeup is authoritative. Being prepared will enable you to finish on time, enjoy the lab more and help you get a higher grade. Except during the first week of classes, a closed book quiz will be given in the first 10 minutes of each lab period to test your readiness to perform that day's experiment and your understanding of the previous experiment. There will be a quiz on the first full experiment, "(1) Introduction to Computers and Uncertainties".

Arrive on time or you will miss the quiz and the credit. All the materials to be graded (including data sheets, graphs, answers to questions, etc.) must be completed during your lab period and handed in to the instructor before leaving the lab. The lab report consists of a data sheet in the form of an Excel spreadsheet, formula view of the Excel spreadsheet, graphs with comments and answers to questions. **Print** your name (block letters not cursive), and also your lab partner's name and your section number on the data sheet.

During practical labs, no outside notes, calculators or discussions with other students are allowed. After the last session of experiment preceding the each practical lab has finished, the experimental write-up will be available on the course website. During the practical lab, you will be given a copy of the experimental write-up to use. The practical lab will be based on one or more of the experiments that you have already completed. It could consist of measuring and analyzing data and answering questions as you do for other labs. The time limit on the practical lab will be 45 minutes.

HINTS ON WRITING A GOOD LAB REPORT:

Write clearly and neatly in full sentences. Avoid wordiness and excessive detail.

- Your TA will also show you how to print the Excel formulas used in your spreadsheet.
- Once you are satisfied with your plot (binning is correct, labels are clear, axes are labeled and have units!), you can make a best fit for the parameters of an expected functional dependence and include the results on the plot. The plot can then be saved, printed and attached to your worksheets.

Whenever your lab report includes a graph, you need to write what would be a good figure title and caption:

Title:

- The x and y axis labels should also give the physical quantity being plotted, not just the units.
- The title should describe the physical situation the graph represents, for example “Volume of water leaked through the roof vs. time”, not just the units as in “liters vs. seconds”.

Caption: the graph should have your handwritten comments covering the following points:

- What is the expected functional form of the equation describing the data.? For example “The water volume is expected to follow the linear equation $V = R t$ ”.
- What does the graph actually tell you? For example “The leak rate R is given by the slope of the best fit line. The data generally follows the expected linear trend, except that the volume at $t=0$ is not consistent with zero as this formula would predict.”

You will go over some examples in your first class meeting.

- If the results didn't come out as you expected, try suggest why not. (Don't just attribute it to "human error"!)

GRADES

Laboratory reports & quizzes will be graded by your instructor on a 20-point scale and will be handed back at the beginning of the next lab. The points will be distributed roughly as follows: quiz (4 pts), acquisition of data (including accuracy) (4 pts), graphs and calculations (8 pts), answers to questions (4 pts); details will vary somewhat depending on the important points of individual experiments.

Your course grade will be based on the total number of points for the labs and quizzes, dropping the lowest lab score of the semester before computing your grade (see below for policy regarding missed lab). Since the instructors for the various sections do not necessarily grade identically, the scores for a given instructor's sections will be considered as a group for grading purposes. Each of the groups will receive approximately the same average grade in the course, so that there is no advantage to having one instructor rather than another. Within the group, the grades will be assigned strictly in order of points achieved. The grade will be assigned by a curve. In the past, the average for the course has been approximately 3.0. Please obtain from your instructor and save **all** your graded lab reports and quizzes. Disputes on grading must be dealt with promptly, before the next class meeting, rather than at the end of the semester. Disputes on calculation of your overall course grades will require submission of all your graded materials.

ACADEMIC HONESTY. Only the data you take during the lab will be common with your lab partner. Lab partners are expected to turn in printed versions of the same Excel data sheets and Graphs. Identical or slightly

modified copies of the hand-written answers to the Questions or on a Graph, will result in both students receiving a zero lab score. See MSU's policy on Academic Integrity at <https://www.msu.edu/unit/ombud/academic-integrity/index.html>; here are some excerpts with *emphasis added*.

The principles of truth and honesty are recognized as fundamental to a community of scholars. The university expects both instructors and students to honor these principles and, in so doing, to protect the validity of university education and grades. Practices that maintain the integrity of scholarship and grades include providing accurate information for academic and admission records, adherence to unit-approved professional standards and honor codes, and *completion of original academic work by the student to whom it is assigned, **without unauthorized aid of any kind***. To encourage adherence to the principles of truth and honesty, instructors should exercise care in planning and supervising academic work.

If an instructor alleges a student has committed an act of academic misconduct, the instructor is responsible for taking appropriate action. *Depending on the instructor's judgment of a specific instance, the instructor may give the student a penalty grade*. A penalty grade may be a reduced score or grade for the assignment or a reduced grade for the course. When an instructor gives an undergraduate or graduate student a penalty grade for academic misconduct, *the instructor must complete an Academic Dishonesty Report form online*. The student's academic dean will add the form to the student's academic record, where it will remain, unless the student successfully grieves the allegation. In notifying the student's academic dean of the student's act of academic misconduct, *the instructor may ask the student's academic dean to initiate an academic disciplinary hearing to impose sanctions in addition to, or other than, a penalty grade*.

MISSING LABS/MAKE-UP LABS

Because personally participating in each laboratory is the essential part of this course, you must be present for each session. Make up labs are limited to attending another regularly scheduled section performing the same experiment. Make ups are only available for students who miss a lab for a legitimate reason. Should you find yourself in a position where you must miss a session, you must inform your instructor beforehand, and provide an explanatory note with suitable documentation. Arrangements to attend another section must be made with your lab instructor. However, many of the sections are full so it may not be possible to find room in another section; look on the registrar's pages to find current enrolment in sections and their meeting time. If you miss a lab for an unanticipated reason, such as illness, you must notify your instructor no later than 24 hours after the missed lab and provide suitable documentation. If you are unable to arrange a makeup lab, the missed lab will have a score of zero. We will drop the lowest lab score of the semester for each student in computing grades.

Your instructor is in charge of all aspects of laboratory procedures. Your instructor can ordinarily solve most problems. Communications regarding the day-to-day operations of your section should be directed to your TA NOT the lab coordinator. (i.e.: a missed lab, attending another section, etc.). **Record your TA's name and email**, and the course web site, on the inside front cover of your laboratory course pack.

The laboratory coordinator for this course is Professor James Linnemann (BPS 3245). If you need to make an appointment, send an e-mail to linnemann@pa.msu.edu. Please include a phone number and a copy of your academic schedule so he can get back to you and set up a mutually convenient time.

COMPUTERS IN PHYSICS 251

Computers controlled by a central server will be used in all the physics undergraduate labs.

- Bring a flash memory stick so you can save your files as you work. There is no space on the computers to save your lab files, and they vanish when you log out!
- **SAVE YOUR DATA OFTEN!!** If something happens to your work during the lab and it is destroyed, you will have to do the lab again.
- All the necessary computer software and spreadsheets will be on the computer when you start. We will use Excel for spreadsheet work and do plotting and fitting using Kaleidagraph (not Excel). Kaleidagraph is better at finding parameter values which best fit data sets, and reporting the uncertainties on the parameters. This fitting

is a common procedure in science, and we will need to perform fits this course. The input for the plots can be copied from an Excel spreadsheet and pasted, or typed directly into a Kaleidagraph data table.

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