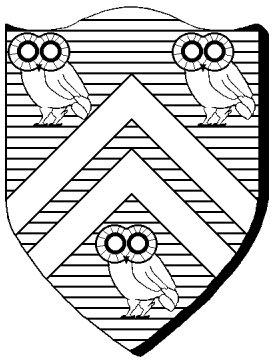

RICE UNIVERSITY

PHYSICS 101
Laboratory Manual

Fall 2009

Contents

Physics 101

I. Schedule of Experiments - Fall 2009

WEEK OF	EXPERIMENT
Aug. 24	None; First week of classes
Aug. 31	None
Sep. 7	1. Kinematics in 1-D
Sep. 14	2. Projectile Motion
Sep. 21	3. Forces
Sep. 28	None
Oct. 5	4. Uniform Circular Motion
Oct. 12	None; Fall break
Oct. 19	5. Energy Conversions
Oct. 26	None
Nov. 2	6. Collisions in Two Dimensions
Nov. 9	None
Nov. 16	7. Angular Dynamics
Nov. 23	None; Thanksgiving break
Nov. 30	8. Simple Harmonic Motion; Last week of classes
Dec. 7	Make-up period Dec. 7 - 8 only (special sign-up)

II. General Information

> "The truth is, the science of Nature has been too long made only a work of the brain and the fancy. It is now high time that it should return to the plainness and soundness of observations on material and obvious things."
>
> R. Hooke

LABORATORY OBJECTIVES

The laboratory work associated with Physics 101 has two principal goals: To give you hands-on experience with the phenomena and models you will study in class; To develop basic experimental and analytic skills that will be used throughout your career in the sciences or engineering.

The laboratory exercises that you will do here are not "experiments", in the sense of forays into the unknown designed and executed by an intrepid young scientist (you). Rather, they were chosen to illustrate physical phenomena, ingenious techniques or useful methods. They were not intended to be extremely precise, and your results will be far from exact. You will be evaluated on your understanding of the material and your approach to problems, not merely the precision of your results, and you should allocate your effort accordingly.

As one of the earliest laboratory courses in your career at Rice, PHYS 101 will emphasize very basic skills. You should develop the ability to carry out common laboratory procedures correctly and safely; To make measurements and report your results in physically meaningful form, including estimates of uncertainties where appropriate; To recognize when equipment or procedures are not working, and undertake logical corrective action. You will also have the opportunity to communicate your results in the form of short reports on each experiment. To see how these goals fit into the overall laboratory program at Rice, you can consult the overview of laboratory objectives at http://www.owlnet.rice.edu/~labgroup/.

LABORATORY ORGANIZATION

Your laboratory group will meet for three hours each week that an experiment is scheduled. Each session will begin with a ten minute quiz, discussed below. You and your partner should use the remainder of the time to collect and analyze the data for the experiment, and to each prepare a brief report of your results.

Attendance at the laboratory session is mandatory. If you must miss your regular meeting for any reason there are two options:

a) You may attend another session during the week, with permission from the instructor in charge of the "host" section. Permission will not be granted if the section is full.
b) You may attend the make-up sessions after the last week of labs. Note, though, that you will not be allowed to make up more than one experiment this way. A sign-up sheet will be provided during the last week of labs for you to schedule your attendance.

DATA TAKING

It will be difficult to complete a lab if you have not read over the experiment before class. As you read, try to "think through" the experiment in order to decide what quantities you will vary, how the data should be plotted, and what you think the results should be. You may also want to lay out the data tables you think you will need, and make note of useful formulae. Remember to bring a calculator to class.

Once the apparatus is set up, you can start taking data. You and your partner will often need to work together to get the data and record it efficiently. In any case, you should both try all phases of the experiment, rather than becoming specialists. If at all possible, make a plot of the data as you go along. Your graph will very quickly tell you if the data are reasonable, if the parameters are being varied enough, and if the apparatus is working.

The apparatus you are using, although relatively simple, is remarkably expensive. Please be gentle so that neither you nor the apparatus is damaged. Particularly delicate or hazardous operations are noted in the lab manual as they occur. Please heed the warnings. If a piece of equipment does malfunction, please tell the instructor so it can be tagged for repair. We usually have a spare with which you can finish the lab.

REPORTS

A template will be provided for each exercise. Record the data as indicated, attach supporting plots, and answer the questions posed.

The laboratory assistants have been instructed to collect all reports at the end of the lab session. The report will be returned to you, graded, at the next regular meeting.

QUIZZES

At the beginning of each lab meeting you will be given a ten minute quiz on the lab you are about to start. The questions will concern items which you should have noticed in reading over the experiment prior to the lab meeting. You may use the lab manual in answering the questions, but if you have thoughtfully read the experiment in advance you will not need the manual.

GRADES

The lab grade is based on quiz scores, performance during lab sessions and quality of the lab reports. The resulting score will be reported to the lecturer as your grade for the laboratory portion of PHYS 101.

Grading is a necessary evil but you should be aware that most students do reasonable work and get good scores. A good grade is not, therefore, the most valuable thing you can get from this course.