

# Syllabus for Physics 0212

## Introduction to Laboratory Physics

### Fall 2014

#### Course and Instructor Information

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#### Course Description and Objectives

All science relies on the process of experimentation to prove the validity of its theories and hypotheses. A theory which fails experimental verification must be discarded in order for science to make progress. Understanding how to carry out a scientific experiment is therefore vital to understanding science and furthermore to understanding the very meaning of a scientific theory. Since experimentation is common to all scientific disciplines useful skills and experiences obtained in this course can be broadly applied.

A typical introductory physics course sequence, such as Physics 0110 and 0111, teaches the student the basic principles of Physics that were learned through the interplay of theory and experiment over several hundred years. With this background, students will test the validity of many of the scientific principles and learn to properly carry out a scientific measurement. You will start from the basic principles from introductory physics and proceed to obtain experimental measurements, analyze them, and report the results. By the end of the course you will have become proficient at using modern tools of experimental science including electronics test and measurement devices and digital data acquisition systems. You will also learn how to present scientific results through the preparation and peer evaluation of two detailed formal lab reports.

The course is structured in two parts, a recitation and a lab with attendance required for both. The 50-minute recitation lecture will introduce the physical principles that are to be demonstrated by the experiments in the lab sessions. The lab sessions will include instruction on how to use the equipment and how to perform the experiment. The remainder of the lab will be used to collect and analyze the data.

#### Required Materials

The following materials are required for the course and may be purchased at the University Book Center.

- 1) A lab manual titled, *Introduction to Laboratory Physics* by Russell J. Clark.
- 2) The *Student Lab Notebook with Spiral Binding* (50 Carbonless Duplicate Sets) by Hayden McNeil. (**YES- this is also REQUIRED- you must turn in the duplicate copy of your lab data at the end of each lab session.** ).
- 3) A scientific calculator that has trigonometric, logarithmic and exponential functions. Statistical functions are also useful.

## General Information for the Labs

- 1) **Eating and drinking are not permitted in the labs.** This is both for your safety and to prevent damage to the laboratory equipment.
- 2) **Students are responsible for reading and understanding the section in the manual on the scheduled experiment before coming to the lab class.** Make sure you understand the physical principles to be demonstrated and the general procedure for the experiment. The more prepared you are, the faster and easier the lab will go. If you have any questions about the experiment, feel free to ask them at any time in lecture or in the lab. A schedule of the experiments is listed below.
- 3) The lab teaching assistant (TA) will give instruction on the experiment and the procedure. **Listen to this presentation very carefully** as the TA will explain exactly how to use the equipment and perform the experiment. Failure to follow the instructions could result in wasted time and damaged equipment. It could also pose a threat to your safety and the safety of those around you.
- 4) Before starting the experiment, make sure you understand the function and purpose of the equipment. The lab manual should provide sufficient documentation for using the equipment, but if there is anything you do not understand, ask the TA.
- 5) Students will work in groups of two with the following exceptions. If a class has an odd number of students, one group will have three people. If a lab session has more than 16 students, there will be one or more groups of three. If a piece of equipment fails and cannot be replaced, the members of that group will split up and join other groups. **Under no circumstances should a group have more than three students.**
- 6) Once the data is collected, you should analyze it before you leave the lab so that if you have any questions about the analysis you can ask your TA for help. Also, if you find some of your data is flawed or inconsistent you will have the opportunity to fix the problem and collect a new set of data.

## Lab Notebooks

Each student will keep a lab notebook, which is a vital practice for any scientist. The purpose of the notebook is to record all aspects of the experiment and to write down any information that may be of importance. If you are unsure if something is important, write it down anyway. Be neat, concise, clear and legible when writing in your notebook. Here are some guidelines for what to include:

- 1) Write down notes about the experimental procedure, possible sources of error, safety considerations, equipment status and any general observations you care to make. Include the title of the experiment, the date and the names of your TA and lab partners.
- 2) Record the conditions under which you performed the experiment. Some experiments require that you change the parameters each time you collect data. Make sure you record those parameters before you start. For instance, in the lab on Oscillatory Motion you will record the period of a simple pendulum for five different lengths. You should record each length in your notebook before you begin taking the data.
- 3) Record your data. In some experiments you will record the data by hand just by writing down your measurements. Be neat and tabulate the data so it is easy to read. Label the data and include physical units. Having a table of numbers is no good if you do not know what those numbers mean. In other cases a computer will collect and store large data sets. In actual research you would then record the file name and location of the file but here you only need to record the results of the analysis such as the slope and intercept from a linear fit to the data.
- 4) Record your mistakes. Even scientists are human, so you will sometimes make a mistake in the procedure or in setting up the experiment and you will record flawed data. Do not erase the data or delete it. Just make a note of the mistake, fix the problem and record a new set of data. You should not include the

flawed data in your analysis but you should still keep a record of it because you can often learn a lot from your mistakes.

- 5) **You will turn in the carbon copies of your lab notes at the end of the lab session.** The data in these notes will be checked for agreement with the data you enter in the informal lab report on LON-CAPA as proof that you attended the lab. You will not get credit for the report if you do not turn in the carbon copies.

## Lab Schedule

#	Week	Lab Title	Room
1	8/25/2014	Ballistic Motion	402
2	9/1/2014	One Dimensional Motion	408
3	9/8/2014	Oscillatory Motion	402
4	9/15/2014	Fluid Mechanics	408
5	9/22/2014	Sound and Human Hearing	402
6	9/29/2014	DC Circuits 1	408
7	10/6/2014	DC Circuits 2	408
	10/13/2014	Fall Break	
8	10/20/2014	The Charge to Mass Ratio of the Electron	402
9	10/27/2014	Optics 1	408
10	11/3/2014	Optics 2	402
11	11/10/2014	Optical Spectroscopy and Atomic Structure	408
12	11/17/2014	Radiation and Radioactivity	402
	11/24/2014	Thanksgiving Break	
	12/1/2014	MAKEUP LABS (see below)	

### Make up Labs

If an informal lab session is missed during the semester for an official reason you will have an opportunity to make it up during the last week of classes. You are permitted to make up **one and only one lab**. **The make up week cannot be used to redo a lab which you performed poorly on or for which you failed to enter data into Lon Capa.** Your lowest informal lab score will be dropped in any case.

### LON-CAPA Website

We will be using an online system called LON-CAPA to submit informal lab reports and to complete the pre-lab quizzes. The website may be accessed at the following address (there is also a link in Courseweb):

<http://homework.phyast.pitt.edu/>

Your username for this system is the same as your Pitt email username and your initial password will be your PeopleSoft ID number (available through my.pitt.edu).

## Pre-lab Quizzes

Before each week's lab you will be expected to complete a pre-lab quiz in LON-CAPA on the lab material. The quiz will be automatically graded (see LON-CAPA for deadlines). There will be no quiz before the first lab. **No credit will be given for quizzes after the deadline (no exceptions).**

## Informal Lab Reports

Data taken during the lab must be entered and you will then proceed through the lab report and enter your answers in LON-CAPA. Your lowest informal lab report score and your lowest pre-lab quiz score will be dropped. **No credit will be given for reports that are late (no exceptions).**

## Formal Lab Report

Scientists generally communicate the results of their experiments by submitting articles to peer reviewed journals. The journal editors send each article off to a group of peers (experts in the field) who review it and determine if it is worth publishing. Generally the peers will return the article with comments and suggestions the author (or authors) must address before it can be published. This iterative peer review system is what assures the integrity and quality of scientific papers.

In this class you will write one formal lab report which will be structured like a journal article. Instructions on how to write the report will be given in the lecture and sample reports will be made available in Courseweb. Your first draft of the formal lab report will be graded by a peer review process where the peers are other students in this same course. Your final draft will also be submitted in the peer review system but will only be graded by your TA

We will simulate the peer review process by using an online software package called SWoRD (Scaffolded Writing and Rewriting in the Discipline). After you complete each formal lab you will write a first draft of your report and submit it to the SWoRD system. There it will be anonymously reviewed by approximately four peers (other students in this course). In turn you will also be required to review approximately four other reports. Note that you will be graded on both your first draft and your feedback on these other reports. Using the feed back from the peer reviewers you will modify your first draft and submit a final report to your TA. The first draft (including your peer reviews) will be computed by the SWoRD system and will be worth 25% of the report grade. The final draft is to be turned in to and graded by the TA. It will be worth 75%. **You may write the formal report on any lab completed prior to the due date for the first draft.** A schedule of the due dates and deadlines for the peer review process is given in the table below. All deadlines are strict and must be met to receive credit for the formal lab report (see below).

**Each student is required to write his or her own formal lab report. Lab partners may work together to take data, but must write and submit separate formal lab reports. Plagiarism will not be tolerated. Reports will be cross checked for similarities using turnitin.com and reports that are flagged will receive 0 for the final grade.**

## Formal Lab Report Schedule

First Draft	First Draft Reviews	Final Draft
10-19	10-26	11-02

**The deadlines listed in the table above are strict deadlines. If you submit a report or review up to 24 hours after the deadline your grade will be reduced by 20%. Assignments submitted more than 24 hours after the deadline will not be accepted and will receive a grade of zero.**

## Grades

The recitation lecture will utilize the Student Interactive Response System (SRS) to take attendance. This system consists of hand-held infrared transmitters, called pads, assigned to individual students. The pads will be stored in bins on a cart at the front of the room so that you may pick up your pad before lecture and then place it back there at the end of lecture. **Do not take the pads out of the classroom!** Many other classes use the same system and pads. Remember, if a pad is missing the SRS system makes it easy to identify the student who last used it.

Please observe the following rules for the SRS:

1. Memorize your pad number and the bin where it is located.
2. Pick up your pad as you enter the classroom.
3. If your pad is missing, check nearby bins as it may have been misplaced. If you still cannot find it then ask the instructor which pad you may use as an alternate.
4. **Do not pick up a pad that is not assigned to you or use more than one pad. If you are caught with more than one pad both pads will be given 0 attendance points.**
5. There are multiple receivers in the hall, aim your pad at the one with the clearest line of sight. A red light will flash on the receiver when it receives your answer and your pad number will change color on the computer screen, valid answers are blue and invalid answers are red. You may push any key (A to E) to be counted when the instructor takes attendance. The F, G and H keys are not used.
6. **Place the pad back in the proper bin at the end of lecture.**

The lowest informal lab report and the lowest quiz grade will be dropped. **Makeup labs will be given at the discretion of the lecture instructor. You must have an official excuse to make up a lab report.**

Your grade will be based on attendance, informal reports, 1 formal report, and lab quizzes. The grades are weighted according to the table below.

Attendance	5%
Pre-Lab Quiz	20%
Formal Lab Report	15%
Informal Lab Reports	60%

## **Courseweb**

The University of Pittsburgh provides an online portal for participating classes called Courseweb and a site has been created for this course. Here you will find relevant course material such as a copy of the syllabus, sample exams, etc. You may also view your grades online through this site. To access the site go to

<http://courseweb.pitt.edu>

and login using the username and password for your Pitt email account. If you need to setup your email account or have forgotten your username and password then call the computer center help desk (4-HELP or 412-624-4357). Once you are logged in, you will see a list of your courses that participate in Courseweb. Clicking on the title of this course will take you to the associated web site. Feel free to contact the instructor or use the online help if you have questions about how to access the material.

## **Students with Disabilities**

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services, 216 William Pitt Union, (412) 648-7890/ (412) 383-7355 (TTY), as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course. A comprehensive description of the services of that office can be obtained at:

<http://www.drs.pitt.edu>