

Syllabus for Physics 0219

Basic Laboratory Physics for Science and Engineering

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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 0174 and 0175, 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 the scientific principles and learn to perform scientific measurements. 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 of a detailed formal lab report.

The course is structured in two parts, a lecture and a lab with attendance required for both. The 50-minute 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, *Physics 219: Basic Laboratory Physics for Science and Engineering, 2013* by Russell J. Clark. **(This lab manual is posted online in Courseweb).**
- 2) **RealTime Physics Module 3 :Electricity & Magnetism**, by D Sokoloff and P. Laws, (Wiley 2012).
- 3) *The Student Lab Notebook with Spiral Binding* (50 Carbonless Duplicate Sets) by Hayden McNeil. **(REQUIRED- you must turn in the duplicate copy of your data at the end of each lab session.).**
- 4) A scientific calculator that has trigonometric, logarithmic and exponential functions.

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. **You must turn in the duplicate copy of your data from your lab notebook at the end of each lab.** (This does not apply to labs from the RealTime Physics Manual).

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) For labs in the Physics 219 Lab Manual. 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.

Lab Schedule

#	Week	Lab	Room
1	8/29	Acceleration in One Dimension	408
2	9/5	Oscillatory Motion	402
3	9/12	Rotating Fluid	408
4	9/19	Velocity of Sound	402
5	9/26	RealTime Physics : Module 3-4	408
6	10/3	RealTime Physics : Module 3-5	408
7	10/10	RealTime Physics : Module 3-6	408
	10/17	FALL BREAK	
8	10/24	RealTime Physics : Module 3-8	408
9	10/31	RealTime Physics : Module 3-9	408
10	11/7	Realtime Physics : Module 3-10	408
11	11/14	Geometric Optics	402
	11/21	THANKSGIVING BREAK	
12	11/28	Physical Optics	408
	12/5	MAKEUP LABS	

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 pre-lab quizzes. LON-CAPA 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 on the material covered in the lab to prepare you to perform the experiment. There are two formats for the Quizzes based on whether the experiment to be performed is in the **Physics 219 manual** or the **Realtime physics manual**. Quizzes associated with the Physics 216 manual (# 2, 3, 4, 11, & 12 in the Lab schedule table) are posted in LON-CAPA and are to be completed electronically. They will be automatically graded (see LON-CAPA for deadlines. Note that there will be no quiz before the first lab). For experiments in the Realtime physics manual, the quiz is at the beginning of the specified Module (titled Pre-Lab Preparation Sheet). The quiz is to be completed and turned in directly to the Lab TA at the beginning of the lab to be performed. Quizzes will **not be accepted after the lab begins** ! So do not forget to bring them.

Informal Lab Reports

Method of Informal lab report submission will also be based on whether the experiment to be performed is in the **Physics 219 manual** or the **Realtime physics manual**. For Physics 219 manual labs (#1, 2, 3, 4, 11, & 12) you will enter the data and step through the calculations using LON-CAPA). These reports will be automatically graded when the deadline for the lab passes. RealTime physics manual labs will be completed by hand using the worksheet in the lab manual and turned in to your TA by the specified time.

No credit will be given for reports that are late.

Formal Lab Report

In this class you will write one formal lab report which will be structured like a journal article. More information on the content and style will be provided in the lecture hour and will be posted in CourseWeb.

Lab partners 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 reports will be turned in to your TA. Late reports will incur a penalty.

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 report grade and the lowest quiz grade will be dropped. **Makeup labs will be given at the discretion of the lecture instructor. There will be NO makeup quizzes. You must have an official excuse to make up a lab report.** Your grade will be based on lecture attendance, informal reports, the formal lab report, and pre-lab quizzes. The grades are weighted according to the table below.

Lecture Attendance	5%
Pre-Lab Quiz	20%
Formal Lab Report	15%
Informal Lab Report	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>