

Physics 174: Physics Lab Introduction, Fall 2016

Dr. Wendell T Hill III

What the course is about: Physics 174 is an introductory Physics Lab that meets for one hour and 50 minutes each week in Room 3115 of the Physics Building. In this course you will be expected to master a few basic ideas and tools that you will need for later Physics labs, including: understanding experimental errors, using computer spreadsheets for analyzing, plotting and fitting data, and working with simple electrical circuits and electrical measuring equipment.

Co-requisite: Math 140 (Calculus I). You will need to know how to take derivatives of functions starting about one month into the course.

Required Electronic Textbook (Lab Manual)

- *Introduction to the Physics Laboratory*, Thirteenth Edition (June 2015). You must use the Thirteenth Edition **because earlier editions are no longer valid**.
- To purchase and access the electronic textbook (lab manual) go to this link:

Student Registration - PHYS 174

Registration Link:

<https://www.theexpertta.com/registration/>

Registration Code:

Section 0102: USH22MD-251618-1EV

Section 0103: USH22MD-425089-1EU

Section 0108: USH22MD-96936C-1ET

- If you want to bring a paper copy of each exercise to class please print it out before coming to class. Many students have found it convenient to read electronic versions from their pads or laptops.

Recommended Textbook:

- *An Introduction to Error Analysis* by J.R. Taylor
- or**
- *A Practical Guide to Data Analysis for Physical Science Students* by Louis Lyons

How the course works: This course is intended to give you hands-on experience with measurement techniques and basic data analysis, which is required for learning physics via experiments. This course is NOT about learning basic physics---that is done in the lecture courses (e.g., PHYS 171, 272, etc.). While there are NO lectures in this lab course, your instructor will give a very brief overview of each week's exercise at the beginning of class (so please be on time!). For the rest of the class time you will work through the lab exercise on your own, following specific instructions in the Lab Manual. You'll answer a series of questions as you work through each exercise. Your instructor and TA will be available to help when you need it. It is quite important that you familiarize yourself with each week's exercise BEFORE you

come to class. It is equally important to review your work AFTER each lab session. At the end of the lab period you will turn in your work, normally in the form of an Excel spreadsheet that you will submit electronically using ELMS. Note, with the current version of ELMS you can upload and submit your assignment multiple times. You have an opportunity to complete or redo any part of the calculations for a lab at home and submit a revised version before the deadline to be graded. **If you do not turn in a revised version the version submitted at the end of class will be graded; be sure to turn in a version at end of class and save a copy somewhere for yourself just in case your upload did not work properly. Always check you uploads to ensure they are what you intended to submit.**

Reading assignments: These are designed to help prepare you for the lab exercises, so that you can make the best use of your time in the lab. An hour and 50 minutes may seem like a lot of time, but it isn't. Preparing in advance by looking over the weeks exercise and doing the reading assignment will help you finish on time.

Homework and Final Spreadsheet: Homework is assigned at the end of most of the exercises. The homework is done electronically via the ExpertTA link. Depending on how quickly you've completed the in-class exercise, you may have some time left to do the homework before you leave. **You must complete your homework and your final spreadsheet by 11:59 pm on the Monday after your lab session. EVEN IF YOU HAPPEN TO MISS THE WEEK'S LAB THE HOMEWORK IS STILL DUE ON TIME!**

Exams: The course includes two in-class practical exams that will involve making measurements and analyzing the data you collect, much like the regular exercises. (In fact, the Lab Manual gives example questions in Exs. 7 and 14.) The instructions and questions for these exams will be handed out at the beginning of the lab period on the scheduled exam dates.

Course web site: Course information, the week-by-week schedule of lab exercises, and other documents are posted in the ELMS (Canvas) system. **You will use the course web site to turn in your Excel spreadsheets from the in-class exercises**, and will also be able to use it to view your grade on each assignment. You should be able to log in at <http://elms.umd.edu>, and the course should appear in the "My Courses" panel.

Course sections:

Section	Day	Time	Teaching Assistant
0102	Wednesday	14:00-15:50	Renjie Zhao renjiephys@gmail.com IPST 1102
0103	Thursday	14:00-15:50	Shangjie Guo shangjie.guo@gmail.com PHYS 0104
0108	Wednesday	16:00-17:50	Shangjie Guo shangjie.guo@gmail.com PHYS 0104

Week-by-week schedule: We will skip Exercises 1, 5 and 13 in the lab manual. HOWEVER, you must be familiar with using Excel (Exercise 1) in order to do all the other exercises. Make certain to read through Exercise 1 and complete sections VII and VIII before you come to the first class (i.e., before the week of August 29). This work does not have to be submitted for grading. Exercise 1 should be used as an Excel reference throughout the course.

P 174 - Schedule of Labs - Fall 2016 – R. Greene and W. Hill

Week of	Topic
Before 8/29/2016	Exercise 1: Introduction to Excel Do on your own before first class meeting!
8/29	Exercise 2: Measurement Error and Uncertainty
9/5	Exercise 3: Measurements, Averages, and Standard Deviations
9/12	Exercise 4: Straight Line Fits Using χ^2 and Excel
9/19	Exercise 6: Using χ^2 and Propagation of Errors to Test a Theory
9/26	Exercise 7: Review of Spreadsheets and Errors
10/3	Make-up Week
10/10	Exercise 8: Exam on Spreadsheets and Errors
10/17	Exercise 9: Resistors and Multimeters
10/24	Exercise 10: Current and Voltage
10/31	Exercise 11: The Digital Oscilloscope and the Function Generator
11/7	Exercise 12: The Digital Oscilloscope and AC signals
11/14	Exercise 14: Review of Circuits
11/21	Thanksgiving Week; No Labs
11/28	Exercise 15: Exam on Circuits and Error analysis
12/5	Make-up Week

Course Policies:

Arriving Late to Class: Classes at Maryland begin right on the hour. It is important that you arrive on time to the lab so that you can get instructions for the lab and have time to finish. If you arrive more than 10 minutes late, you may not be allowed to do the lab and may have to make it up during another section. This is difficult because the sections are typically full, so please don't be late.

Lab Makeup Time: If you must miss your regular lab section (due to an excusable absence as articulated at <http://www.ugst.umd.edu/courserelatedpolicies.html>), then you should make that lab up by going to another section that same week, if possible. Contact your instructor and the instructor of the other section (if different) to let them know that you need to do this and to check whether there is space available. If you cannot attend another section, contact your instructor ASAP and a time for a make-up lab will be arranged. In general, this should be done during the same calendar week as the lab is scheduled (so that the equipment for the lab is still set up). Otherwise, you will have to make up the missed lab during the make-up week. **The make-up lab spreadsheet is due the Monday after the make up is performed. Again, homework is due at the regularly scheduled time; you do not get extra time to make up homework even if you miss a lab.** Because the other sections are typically full, it is also very hard to do a make-up, so please do not miss your lab section.

Grading:

- 40% Lab Spreadsheets
- 10% Homework
- 25% Test on spreadsheet, errors and measurements
- 25% Test on the oscilloscope and electrical circuits

General Comments on Grading Assignments: Finishing all the labs *and* homework sets is very important. Missing a lab will generally cost you one letter grade in your final grade, so be sure to come every week. Missing even one homework set will hurt your grade too, so do the best you can to complete all assignments. Do the homework early, so that you have time to ask your TA or instructor questions if something gives you trouble. Also, if you can't completely finish a homework assignment, submit what you have done *before* the deadline. **No credit will be given for late homework.** When you are working on the homework, feel free to discuss among yourselves to try to figure out what is going on. Homework will be graded electronically by ExpertTA. **Your homework scores for Exercises 2-6 and 9-12 will be based on your attempt of the question, not the correct answer. The scores for Exercises 7 and 14, however, will be based on getting the correct answer because these are review questions that will prepare you for the exams. You will lose a percentage of your score for wrong answers and you will have a finite number of attempts for each question for sets 7 and 14.** Consequently, you should make certain that you understand the correct answer to each question for sets 2-6 and 9-12.

Honor Code: The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council visit the following URL: <http://shc.umd.edu/SHC/Default.aspx>.

Students with disabilities: Accommodations will be provided to enable students with disabilities to participate fully in the course. Please discuss any needs with your instructor at the beginning of the semester so that appropriate arrangements can be made early in the semester.

Weather and emergency closures: If the University is closed due to weather or some emergency situation on the *scheduled date of an exam*, then the exam will be given during your next regularly scheduled class period when the University is open. If the University is closed on your regular class day in any other (non-exam) week, *including the "review" exercise week before each exam*, then the exam will still be given according to the original schedule. In these or other exceptional circumstances, we will attempt to communicate with students by email. If a religious holiday falls on your lab session or exam day let your instructor know ASAP and suitable arrangements will be made.

Instructor Contact Information:

Dr. Wendell T Hill III
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