Physics 174: Physics Lab Introduction, Spring 2019 (v. 0.985, Jan. 28, 2019)

Dr. Theodore L. Einstein

Important Note: this semester the course begins on *Jan. 29 & 30*, during the *first* week!!!

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 which you will need for later labs, including: understanding experimental errors, using computer spreadsheets for analyzing, plotting and fitting data, and working with simple electrical circuits and electrical measuring equipment. This course is intended for, but not limited to, students who are interested in majoring in Physics.

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 Texts: Lab instructions for each week's exercise will be posted on ELMS. This amounts to a Lab Manual. However, students **MUST** purchase and sign up for the online homework problem and grading service Expert TA: https://www.theexpertta.com. See below for instructions on registration for Expert TA.

Recommended Textbook: *A Practical Guide to Data Analysis for Physical Science Students* by Louis Lyons **or** *An Introduction to Error Analysis* by J.R. Taylor, 1st or 2nd ed. The 2nd edition has more examples, problems, and figures, but the section numbering is the same. The first editions of both Lyons and Taylor are on reserve in the STEM Library in the Math Building. Taylor 2nd ed **can be downloaded free** from https://archive.org/details/TaylorJ.R.IntroductionToErrorAnalysis2ed , so there is no need to buy a book.

How the course works: This course is intended to give you hands-on experience with measurement techniques and basic data analysis. You'll spend time in the lab (Toll Physics Bldg., room 3115) each week doing an exercise that focuses on a particular concept, following specific instructions in the Lab Manual. You'll answer a series of questions as you work through each exercise. Your professor and TA will be available to help when you need it. There is a checksheet in the manual for each lab. Their use will be discussed during the first lab meeting. 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. (You will be instructed on how to do this during the first lab meeting. Note, with the current version of ELMS you can upload and submit your assignment multiple times.) You have an opportunity to complete any part of the calculations for a lab at home and submit a revised version 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 it somewhere for yourself.**

Reading assignments 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 doing the reading assignment will help you finish on time and will help you learn more from the course.

Lab Report: Each week, before you leave the lab, you must submit to ELMS an Excel spreadsheet lab report of all the work you completed so far. If you need to make revisions to this report, or finish some parts, you should do so within a few days after the lab, while it is fresh in your mind. To provide some

flexibility and avoid dealing with individual extensions, you will have until 11:59 PM the day before your next week's lab session to submit a revised version; otherwise the version you turned in at the end of lab will be used. Written verification of an illness (or religious holiday or official university event) is needed to obtain permission for a late submission; otherwise, you will get no credit. However, you should not wait till the last two days to do the report, and an illness or event on only those last two days will not count as a valid excuse for tardiness). Graded lab report should be available the following week.

Homework: Homework is typically assigned in the **Expert TA** course website. You will finish and submit your homework through **Expert TA**. The deadline date is 11:59 on the fourth day after the lab. Homework will be accepted until the night before the next lab (without penalty, but with the policy on late submissions is the same as with the lab reports – do not wait until the last two days). Note that if you somehow have trouble accessing **Expert TA**, you can also find the homework problems at the end of each lab write-up.

Lab sections (all meet in room 3115 of the Toll Physics Building):

Lab section	Day	Time	Link for Expert TA
0201	Tuesday	11AM-12:50 PM	http://goeta.link/USH22MD-8DD46D-1RX
0301	Wednesday	1-2:50 PM	http://goeta.link/USH22MD-60CDDF-1RW
0401	Wednesday	3-4:50 PM	http://goeta.link/USH22MD-D4D638-1RV

Expert TA Registration Information

1. Click on or paste the link associated with your section in the table above.

2. Complete registration and payment.

Contact Information for Instructors:

Professor: Dr. Ted Einstein

    Office: 2310 Toll Physics Bldg & 2100E IPST*
    Phone: 301-405-6147 (5-6147)
    Email: einstein@umd.edu

    Office Hours: Dr. Einstein: Mondays 12:45-1:55 in 2310 Toll Physics Bldg., at least initially. You can also make an appointment by e-mail.

Teaching Assistant	Email	Room (TollPh ≡ Toll Phys Bldg)	Phone	Office hours
Gaurav Agrawal	gaurav16@umd.edu	TBA	TBA	Fri. 1:00-2:00pm

*IPST: small building at northwest corner of Regents Dr. and Stadium Dr., just east of PSC

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

TO BE UPLOADED---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. The syllabus is in the syllabus folder and will be updated with new room, etc., information as it becomes available. You may also be able to obtain a subsequent, more complete version of the syllabus of Physics 174 at the web site:

http://www.umdphysics.umd.edu/academics/courses/970-physics-174-physics-laboratory-introduction.html

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 illness, a religious observance, or some other compelling reason), 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). 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:

- 48% Lab Spreadsheets
- 12% Homework
- 20% Test on spreadsheet, errors and measurements
- 20% Test on the oscilloscope and electrical circuits

General comments on 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. Do the homework early, so that you have time to ask questions if something gives you trouble. Also, if you can't completely finish a homework set, turn in what you do have *before* the deadline. **No credit will be given for late homework** unless you have a valid excuse (illness, a religious observance, a university event, or some other compelling reason) for more than the last two days. When you are working on the homework

sets, feel free to discuss among yourselves to try to figure out what is going on. However, do not use these discussions as an excuse to copy someone else's solution to the homework, nor let someone else copy your solution. That is cheating and is strictly forbidden. It is also self-defeating since another part of your grade will come from tests. The right way to discuss the homework is to first work through the problem on your own. Then try to arrive at a definite answer, even if you aren't sure it is correct. With this preparation you can then discuss intelligently with your colleagues and see if you have missed something essential. Of course, you can always ask one of your instructors.

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: www.studenthonorcouncil.umd.edu/whatis.html .

To further exhibit your commitment to academic integrity, remember to sign the Honor Pledge on all examinations: "I pledge on my honor that I have not given or received any unauthorized assistance on this examination."

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.

Weather and emergency closures: If the University is closed due to weather or some emergency situation on a day when homework is due, then that homework will be due by noon on the next day when the University is open. If the University is closed 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. By starting the course in the first rather than the second week of the semester and adding a make-up week, we hope to minimize disruption of the course by closures. Finally, if a religious holiday (or official university event) falls on your lab session or exam day, let us know as soon as possible, and we will make suitable arrangements.

Week-by-week schedule:

We will skip Exercises 3 and 13. Note the dates of our two exams below in bold type.

In contrast to previous years, we will start the lab during the first week of classes for several reasons. In particular, this will allow simpler adjustments in case of university closures due to winter weather, as well as allowing time for review before the pre-exam of Exercise 7.

PHYS 174 – Planned Schedule of Labs — Spring 2019

Week of:	Topic
1/28	Exercise 1: Introduction to Excel
2/4	Exercise 2: Measurement Error and Uncertainty
2/11	Exercise 4: Straight Line Fits Using χ^2 and Excel
2.18	Exercise 5: Propagation of Errors
2/25	Exercise 6: Using χ^2 to Test a Theory
3/4	Make-up for snow days, etc.
3/11	Exercise 7: Review of Spreadsheets and Errors
3/18	Spring Break– No Labs
3/25	**Exercise 8**: **Exam on Spreadsheets and Errors**
4/1	Exercise 9: Resistors and Multimeters
4/8	Exercise 10: Current and Voltage
4/15	Exercise 11: The Digital Oscilloscope
4/22	Exercise 12: AC Signals
4/29	Exercise 14: Review of Circuits
5/6	**Exercise 15: Exam on Circuits and Error Analysis**