Physics 174: Physics Lab Introduction, Fall 2024

Dr. Ki-Yong Kim

What the course is about: Physics 174 is an introductory physics lab course that meets for 1 hour and 50 minutes each week in Room 3301 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 will lay a foundation for higher-level labs in physics and the physical sciences.

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

Required Texts: Students are required to purchase the electronic lab manual from **Expert TA**: https://www.theexpertta.com. See below for instructions on registration for Expert TA.

Recommended Textbooks:
- "A Practical Guide to Data Analysis for Physical Science Students" by Louis Lyons
- "An Introduction to Error Analysis" by J. R. Taylor (1st or 2nd ed).

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 3301) each week doing an exercise that focuses on a particular concept, following pretty 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 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. 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.*

Homework is typically assigned in the **Expert TA** course website. You will finish and submit your homework through **Expert TA**. *No credit will be given for late homework unless you are seriously ill and provide a written note from your physician.*

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.

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.

Lab sections

Section	Day	Time	Instructor	Teaching Assistant
0101	Tuesday	10:00am–11:50pm	Prof. Kim	Georgia Kalapotharakou
0201	Wednesday	2:00pm–3:50pm	Prof. Kim	Georgia Kalapotharakou

Expert TA Registration Information

1. Enter the following links, based on your section number:

Section	Class Registration Code Link
0101	http://goeta.link/USH22MD-23808C-2R6
0201	http://goeta.link/USH22MD-1B9C90-2R5

2. Complete registration and payment.

Contact information

Instructor
Dr. Ki-Yong Kim
Office: Energy Research Facility, Room 1201L
Phone: 301-405-4993
Email: kykim@umd.edu
Office hours: Drop in anytime or by appointment

Teaching Assistant
Georgia Kalapotharakou
Email: gkalapot@terpmail.umd.edu
Office hours: by appointment

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 at that time and may have to make it up during another section. So please don't be late.

Making up missed labs: 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).

Grading:
45%	Lab Spreadsheets
15%	Homework
20%	Exam on spreadsheet, errors and measurements
20%	Exam 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 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, or some other compelling reason.) 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, please visit http://www.studenthonorcouncil.umd.edu/whatis.html .

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 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. Finally, if a religious holiday (or official university event) falls on your lab session or exam day, let me know as soon as possible, and we will make suitable arrangements.

Week-by-week schedule   (Subject to change, updated on Aug 26, 2024)

Tue/Wed	Topic
Aug 27, 28	Exercise 1: Introduction to Excel
Sep 3, 4	Exercise 2: Measurement Error and Uncertainty
Sep 10, 11	Exercise 4: Straight Line Fits Using χ^2 and Excel
Sep 17, 18	Exercise 5: Propagation of Errors
Sep 24, 25	Exercise 6: Using χ^2 to Test a Theory
Oct 1, 2	Exercise 7: Review of Spreadsheets and Errors
Oct 8, 9	**Exercise 8: Test on Spreadsheets and Errors**
Oct 15, 16	Exercise 9: Resistors and Multimeters
Oct 22, 23	Exercise 10: Current and Voltage
Oct 29, 30	Exercise 11: The Digital Oscilloscope
Nov 5, 6	Exercise 12: AC Signals
Nov 12, 13	Exercise 13: Reflection of Voltage Pulses
Nov 19, 20	Exercise 14: Review of Circuits
Nov 26, 27	**Thanksgiving – No Labs**
Dec 3, 4	**Exercise 15: Test on Circuits and Error analysis**

We will skip Exercise 3 in the lab manual.