Physics 1115 Laboratory Online:
Introduction to Experimental Methods

Instructor: Kacey Meaker (kmeaker@randolphcollege.edu)

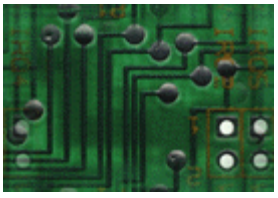
Lab section: Mondays and Thursdays: Time will vary slightly throughout the class, but typically afternoon or early evening.

Lab website: http://physics.randolphcollege.edu/online11/online115/ (instructions for all labs and more)

Office hours: Various times that will be posted on Moodle (and by appointment)

During the remote lab sessions, you are encouraged to log into zoom, so you can talk with your classmates and ask questions about the lab, but you are also welcome to do the lab on your own schedule. I will be available during office hours for questions, and you can also write in the forums on Moodle if you have questions. All of your assignments are due at midnight of the due date.

Lab	Lab	Write-up Format
1	Intro and Statistics	Formal – written
2	Motion	Informal
3	Measure g	Formal – oral
4	Projectile Motion	Informal
5	Vector Addition	Informal
6	Newton's Laws	Formal – written
7	Centripetal Force	Informal
8	Friction	Formal – written
9	Hooke's Law	Formal – oral
10	Conservation of p&E	Informal



Structure of the Laboratory:

This physics laboratory class will consist of pre-laboratory assignments, hands-on experiments, computer simulations, informal lab assignments, and formal lab reports.

A laboratory class supports the theory you learn in lecture. Lab experiments give you the opportunity to explore the physical concepts in greater detail, connect abstract concepts with physical phenomena, and verify the physical laws for yourself. Although most of the labs have known results, we are using real objects and not frictionless planes and point particles, so your answers may slightly differ from the expected theoretical answer. You will be expected to recognize when this happens, and make intelligent observations about why this is the case. You will also be expected to comment on how you would improve the experiment and/or the theory to find a closer match between them. Even if your answer is "correct" you should still be able to think of ways that the experiment can be improved.

Laboratory class also gives you the opportunity to practice skills that are very important to the working scientist. You will practice designing experiments, using experimental equipment, keeping a laboratory notebook, analyzing data, and presenting your work in both an oral and written form.

Computer Programs:

We will use computers extensively in this class, and as this is an online class all of our communication will be via the computer.

We will be using zoom for both office hours and lab sessions. The link to zoom is on Moodle.

Just about all of our assignments and communications will take place through Moodle. I will send you announcements and you will complete all of your assignments. You will also be able to see all of your grades, ask questions on the forums, etc.

We *will be using Microsoft Excel extensively to* analyze data, so one of your first assignments will be to familiarize yourself with Excel if you are not familiar with it already. Hints on this software are on the lab website. You may use Apple Numbers or Google Sheets as an alternative to Excel, but everything might not be exactly the same, especially when it comes to graphing, so heads up on that.

Due to the online nature of this lab, some of your "experiments" will use simulations rather than physical experiments. These should be treated as seriously as the physical experiments.

Pre-Laboratory Assignments:

Pre-lab assignments will be due by the next lab session or as otherwise listed on Moodle. Before completing lab you will need to read the associated lab website as well as complete the "quiz" assignments on Moodle. The Moodle assignments will normally consist of a short lecture and then some questions. You may refer to any material you would like while completing the quizzes. You may repeat the quizzes as many times as you like before the due date, and I will count the highest score. I may not cover everything that you need to do in the lab in the lecture, so it is still important that you **read the theory section and lab procedure** before attempting the lab.

Experiments and Laboratory Equipment:

You will receive laboratory kits before the beginning of class. Please email me if you have not received your lab kit by then. You do not need your lab kit for the first two labs. The contents of the kit can be found on the lab website or on Moodle. If you are taking both 115 and 116, you will receive one kit with all of the equipment you need for both classes. Those of you only taking 115 will only receive equipment needed for this lab class.

Some of the labs will ask you to supplement the equipment with some household objects. Examples include a camera or smartphone for taking video, coins, a ball or similar object. Everything should be readily available, and if you are really having a problem finding something, please contact me, and I will offer a suggestion or help you find a modification.

Reports:

Lab reports will consist of 5 informal lab assignments, 3 written lab reports, and 2 oral presentations (via zoom). Most labs will be due a weekafter t he scheduled lab day. This gives you up to 7 days to complete each assignment, so you need to work hard to keep up with your work. The due dates are on the lab schedule. Formal lab reports will be written up in Word (or equivalent word processing program) and submitted via Moodle. These reports do not need to be extensive, but should be all-inclusive and concise. I will give you more information about what those should include later on.

Your informal lab reports will consist of a "quiz" with a series of questions about the lab on Moodle. You may refer to your lab notebook or any other material you need

while taking the quiz. As with the pre-labs, you may take the quiz as many times as you would like before the deadline, and I will take the highest score. Some of the questions may be open-ended or short answer, so it is advantageous for you to start the assignment early giving me time to grade the assignment and give you feedback at least once before the lab is due.

You will also have two formal lab reports that will consist of an oral report to me over zoom. This is not meant to be a scary or intimidating event but a way for you to practice speaking about science. You will present to me your experiment, what you did, and what you found, and I will ask you some questions about your experiment and what you learned from it. We will schedule these short meetings in advance, and they will take place between June 8 and June 13 (Lab 3) and June 29 and July 4 (Lab).

I will post rubrics for the written and oral lab reports on the website and on Moodle.

Forums:

I hope that you will make use of the office hours and/or lab sessions on zoom, but I know that not all of you will due to scheduling, etc. Because of that, I strongly encourage all of you to make use of the forums that I will set up for each of the lab assignments. You may ask and answer questions about the lab. I will also answer questions. If you have personal questions about assignments (late assignments, missing lab kit items, etc.), please email me, but if you have questions that others might have, please post them to the forum. I know there is a strong reticence to do this for fear of seeming stupid, but I guarantee you that at least one other person has the same question. Posting on the forums will be considered for extra credit if you are close the border between one grade and another. I encourage you to start by introducing yourself.

Notebook:

The laboratory notebook is the scientist's most important tool. You should have a dedicated lab notebook that you can use to keep lab information and record data. The lab notebook should be a bound notebook of some sort that you will not tear pages out of. This is meant to be a real scientific lab notebook, so you should write anything related to the lab in it: notes, data, analysis. Try to keep everything in chronological order and write the date and experiment on each page. Do not erase text or tear out pages. You will use the information in your notebook to write your formal lab reports and answer your informal lab quiz questions. I will not be physically checking your lab notebooks, but if we are meeting in office hours or in lab section I will expect you to have it and be able to show me what you have done.

Policy:

You must complete and turn in all labs. You have the option of attending zoom lab sections and office hours, but none of them are required. If something happens that makes it impossible for you to complete the labs on time, please email me so we can discuss what can be done.

Each lab will be on the web ahead of time, so you should have ample time to read, complete the pre-lab, do the experiment, and complete the lab assignment or report. Late labs will be penalized 10% per day.

Informal Labs 30%
Formal and Oral Reports (5 count 10%) 50%
Pre-Lab Assignments 20%