

Physics 105 Laboratory Online 2019: Introduction to Experimental Methods

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Link to lab instructions: <http://physics.randolphcollege.edu/online10/online105/>

Lab section: Mondays 2:00 - 4:30 pm ET
Thursdays 2:00-4:30 pm ET

- Note – lab sections will be Wednesday and Friday on Week 1

Office hours: Tuesdays 3:00-4:00 pm ET,
Fridays 1:00-2:00 pm ET (and by appointment)

You are welcome to do the labs on your own schedule. If you like, you can log into Zoom (see links above), during the scheduled lab times each week so you can talk with your classmates and ask questions about the lab. But this is not mandatory. I will be available during office hours for questions, and you can also write in the forums on Moodle if you have questions. See calendar below for due dates.

Lab	Lab Day	Lab (See calendar for pre-activity and lab due dates.)	Lab Turn-in Format
01	Week 1, Wednesday	Intro and Statistics	Formal Oral
02	Week 1, Friday	Motion and Error	Informal
03	Week 2, Monday	Measure g	Formal Written
04	Week 2, Thursday	Projectile Motion	Informal
05	Week 3, Monday	Vector Addition	Formal Written
06	Week 3, Thursday	Newton's Laws	Informal
07	Week 4, Monday	Centripetal Force	Formal Written
08	Week 4, Thursday	Friction	Informal
09	Week 5, Monday	Hooke's Law	Formal Oral
10	Week 5, Thursday	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 (both oral and written).

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 differ slightly 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 a working scientist. You will practice designing experiments, using experimental equipment, keeping a laboratory notebook, analyzing data, and presenting your work in both 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. Zoom has a lot of great features such as screen and application sharing and the ability to let someone else control your mouse and keyboard, so I will be able to help you learn how to use the software and help with your data analysis remotely. I will put instructions about how to get on Zoom 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 via Moodle. 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 have not already. Hints on this software are on the lab website and MANY tutorials are at your fingertips by searching Google.

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 midnight of the day before the lab session. Before each 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 PowerPoint 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.

Laboratory Equipment and Lab Kits:

You will receive laboratory kits by the first week 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. If you are taking both 105 and 106, you will receive one kit with all of the equipment you need for both classes. Those of you only taking 105 will only receive equipment needed for the 105 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. Many research scientists must craft their own experimental apparatus!

- A lab kit is required for each lab course, and will be automatically mailed to you. You do not need to request it or purchase it separately.
- All students signed up for a lab will be charged \$30 with their tuition, for each course, for the lab kit.
- If you sign up for both labs (105L & 106L), both lab kits will be mailed together by the first week of your first course.
- If you sign up for one lab, or you sign up for the second semester lab after the first semester starts, the kits will be mailed separately, to arrive to you by the first week of the lab course you need it for.
- If you drop the course before the first lab, and return the kit completely intact, you will receive a full refund for the kit (you are responsible for the return postage).
- If you return your lab equipment, we will give you a rebate. Send your lab kits to Peter Sheldon, Randolph College, 2500 Rivermont Ave., Lynchburg, VA 24503.

[Lab Kit contents can be found here.](#)

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.

Reports:

Lab reports will consist of 5 informal lab assignments, 3 written lab reports, and 2 oral presentations (via Zoom). All labs are due the day of the next lab class at midnight. This gives you 3 or 4 days to complete each assignment and will hopefully keep you (and me) from getting too far behind. The due dates are on the lab calendar above and on Moodle. 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. Write up details can be found [here](#), and I will give you more information about what those should include as well.

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 oral 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 4 and June 7 (Lab 01) and June 28 and July 5 (Lab 09).

Rubrics for the written and oral lab reports are 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. **THERE ARE NO STUPID QUESTIONS!!! 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 ten percent per day up to 5 days after which you will automatically get half off your score.

Informal Labs 30%

Formal and Oral Reports (5 count 10%) 50%

Pre-Lab Assignments 20%

HONOR CODE: Please note that all lab write-ups in this class are pledged work under the Randolph College Honor Code. You can feel free to study and do lab activities with other students but your lab write-ups should be your work alone. If you have any questions about how the honor code applies in this class I will be happy to discuss it with you.

Students with Disabilities: Students with disabilities needing accommodations in summer online classes at Randolph College may send any requests for accommodations and accompanying documentation to accessibility@randolphcollege.edu. Students enrolled at other colleges or universities may submit current letters of accommodation from their home school. Students who are not currently receiving accommodations and would like to inquire about receiving them in summer online classes at Randolph College can send any pertinent documentation or inquiries to the Coordinator of Disability Services at the email address listed above.

ADD/Drop

Online registration and payment **MUST** occur prior to the first class meeting. The drop period is 3 days to have the course not become a part of your student record and the withdrawal period ends on the 7th day. After this you cannot withdraw unless under medical or mitigating circumstances, which must be documented. **To drop or withdraw, email the course instructor who will forward your email to the Registrar. The date of your email will be the date used for the course drop/withdrawal. Payment:** Once you register, you will be billed by Randolph College – the first billing may be as late as May even if you register earlier. Summer tuition for online course is \$450/credit hour and is due prior to the first day of the course. Each lecture course is 3 credit hours, and each lab is 1 credit hour. There is a \$30 lab fee per lab course. If you drop the course before the first day of either class, you get a 100% refund for that class. If you drop the course during the first week, you will be reimbursed 90% of your payment. If you drop the course sometime in the second week, you will be reimbursed 50% of your payment. Beyond the second week of a given course, you will not be reimbursed for that course if you drop it.