

Physics 104 Lab Instructors' Information

Welcome to teaching Physics 104 Lab.

Practical Matters (Getting Started)

Time and Place: All Ph104 labs meet in 201 or 202 McDonnell Hall. They take place from 1:30 p.m. to 4:20, or 7:30 p.m. to 10:20. Labs meet each week starting February 2, 2004 and ending April 29, *except* that there are no labs during the weeks of midterm exams (March 8-12) or Spring break (March 15-19).

Keys: Ask Kathy Patterson (211 Jadwin) for key #133C3. She requires a deposit of \$3, which she will return to you when you give back the key in May. This key opens the main doors to McDonnell 201 and 202, as well as the lab doors. If you ever find the classroom locked (which is unusual), then note that you have another option: your key opens the sliding doors from the labs to the classrooms.

Contact Information: The lab manager this semester is Kirk McDonald. His office is 309 Jadwin, lab = 361, phone 258-6608, cellphone 609-933-6601.
Email: kirkmcd@princeton.edu.

Overview

Your AI duties are to prepare for each week's lab by **trying it yourself**; to help lead the students through the experiments; to help them think about what they are observing; and to grade the students' pre-lab problem sets and their lab notebooks. You will have two sections to teach, each with 12-20 students. We will do our best to keep the number below 18 in most sections, but this will not always be possible.

Before you teach

The most important rule is **do the lab in advance**. It is not necessary to spend as long as the students will spend, or that you write a report. But it is very important that you see and touch the equipment in advance. You should become familiar with any problems and find where various items are stored. Take notes. If the students are asked to make a graph or measure a quantity, you should do so. You will probably discover surprises. You can then decide whether you want to announce your discoveries to students in your lecture, or keep them as surprises for the students.

We will have a short weekly meeting to discuss the recent lab and for me to let you know anything unusual about the next one. Probably we will do this on Thursday. After the meeting would be a good time for you to go try the next lab. You can all go to McDonnell 201 together and help one another with the experiments.

Prelab Problems: The students are given a two-page “prelab problem set” each week. The problems are simple and intended to help the students think about the lab before they arrive to do the experiments. The problems are to be turned in to you at the beginning of the lab.

The prelab sets are to be graded by you, on a basis of 0-3 points: 3=complete and basically correct; 2=mostly complete or correct; 1=partial assignment done; 0=not done. Later, this score will be added to the scores for lab participation and notebook for a total between 0 and 9.

The prelab set will likely generate some questions by the students, which you must be prepared to answer at the beginning of the lab. Hence, you also must work through the prelab sets before the lab!

Teaching the lab

Arrive 5 minutes early, at least. Unlock the lab and the classroom, and bring into the classroom any equipment that you want to use for demonstrations, if any.

Lecture: Before they begin their work in the lab, meet with the students for no more than 15 minutes in the adjacent classroom. The delicate task is to communicate a sense of the joy of learning by doing, rather than by being told about physics. Help them to think about the kinds of phenomena they are about to see, and alert them to any subtle or noteworthy aspects of the work ahead of them. There is a lot of flexibility here, but keep the emphasis on experiment rather than theory. You will have to discover what engages and helps the students.

In the lab room: Don't sit down. Your time in the lab is to be devoted to talking with and helping the students. Spend your time walking to all the lab groups and talking about what they are doing. Ask them questions. Ask “what if...” or “why...”

Time period: The labs are scheduled to take 2 hours, 50 minutes. You should not ask students stay longer than 3 hours. On the other hand, you should try to keep them engaged for most of the time period. If they finish all the printed material in half the usual time period, then you should help them think of some new, related experiment to try or an alternate measurement to make.

On the first day: Students who took Ph103 or Ph105 may wish to use their lab notebooks from last semester rather than buying new ones. These notebooks are in the cubbyholes where they were left in December. Let students go to their previous lab room and find their notebooks.

Guest students: Sometimes students not normally in your class may show up wanting to “make up” a lab they missed earlier in the week. I hope to keep this to a minimum, and I have asked them to get my approval for make-up labs. If they get my permission, then I will email you (so you won't be surprised). But we are requiring that students miss absolutely no labs in Ph104, so please be generous in dealing with these guests whether I have approved their request or not, particularly if you run a Wednesday or Thursday section.

After you teach

After the students finish the lab, take a few minutes to clean and straighten the room. If this takes too long, then you need to ask your students to leave their places clean, throw out their trash, and that kind of thing. If anything is broken, or supplies have run out, then you need to notify Jim Ewart, who sets up and maintains the labs. His office is McDonnell 103. The best way to reach him is to leave a note for him on the front lab bench in lab room 201 or 202. During the day, he might be available if any equipment breaks, but understand that he supervises many other labs and might be busy.

Grading: The students are expected to keep a readable lab notebook, as a sort of journal of their work. They should be writing what they did, what problems they encountered, and what they think might be the reasons for what they see. In the front of the lab manual, you can see what they have been told about our expectations. They are **not** asked to produce a formal lab report. They take their notes during the lab period and leave the notebooks in the lab room for you to grade. Finish grading the notebooks before the next meeting of the section (one week later). Some guidelines to consider when grading a notebook:

- Is the notebook organized enough for you to understand what he/she did?
- Did the student write a clear explanation of what he/she did in lab?
- Did he/she note ideas on *why* the expected or the unexpected occurred? Did he/she think creatively and try to understand the physics?
- Did he/she write about all the main parts of the experiment? If he/she didn't have time to do all the parts, that is fine. But it's not good if he/she did some parts and didn't feel like writing them down.

A simple system of assigning a grade between 0 and 3 (inclusive) should suffice. Let 3 indicate a strong lab notebook; 2=acceptable; 1=weak; 0=not present. We will discuss grading standards more in the early weeks of the course.

Also, each student should get a "participation grade" for his or her performance in the lab room. Is the student engaged in actively helping with the apparatus, in thinking about the experiment, and in talking with you about the science? Again, a similar 0-3 scale should suffice.

Combine the pre-lab assignment, the notebook, and the participation to get a score from 0-9. I expect that a typical score will be 7, but this is of course up to you. We will provide you with grade sheets (Excel files). Enter the score for each student and return them to Martin Kicinski in the department undergraduate office (208 Jadwin, 258-4408, kicinski@Princeton.EDU). Please give Martin the scores before you teach the same students the following week.