

# Caltech

## Physics 5/105 — Fall, 2023-2024

[http://www.sophphx.caltech.edu/Physics\\_5/](http://www.sophphx.caltech.edu/Physics_5/)

### Contacts

#### Course instructor

Frank Rice Lecturer in Physics

Office Hours (in the lab): **TBD**

(626)395-3660

[rice@caltech.edu](mailto:rice@caltech.edu)

202 E. Bridge; M/C 103-33

#### Course TAs

Office hours (in the lab, 202 E. Bridge):

Andrei Diaconu [adiaconu@caltech.edu](mailto:adiaconu@caltech.edu) **TBD**

Duxing Hao [dhao@caltech.edu](mailto:dhao@caltech.edu) **TBD**

Zitian Ye [zye2@caltech.edu](mailto:zye2@caltech.edu) **TBD**

### Recitation and Lab Session Times

*All sessions will be held in the lab, 202 E. Bridge*

#### Recitations

Time:	TAs:
Tue 2:30PM-3:30PM	Andrei
Wed 1:00PM-2:00PM	Duxing

#### Lab Sessions

Time:	TAs:
Thur 2:30PM-5:00PM	Andrei
Fri 8:30AM-11:00AM	Duxing
Fri 1:30PM-4:00PM	Zitian

### Schedule

Experiment 1 ..... 2–6 October

Experiment 2 ..... 9–13 October

(etc.)

Experiment 7 ..... 14–18 November

Experiment 8 (Final project)

Recitations ..... 20–21 November

Detailed design, assembly, testing ..... 27–30 November; 1–5 December

**Presentations** ..... **6 December**

## Course Text

[http://www.sophphx.caltech.edu/Physics\\_5/Physics\\_5\\_105\\_Intro.pdf](http://www.sophphx.caltech.edu/Physics_5/Physics_5_105_Intro.pdf)

[http://www.sophphx.caltech.edu/Physics\\_5/](http://www.sophphx.caltech.edu/Physics_5/)

Recommended (**not required**, and we have copies in the lab):

[Horowitz and Hill, \*The Art of Electronics\*](#)

### ATTENTION! ATTENTION! ATTENTION!

Each week's experiment, *especially Experiments 1 and 2*, will require **at least two or three hours of preparation and completion of a homework set** prior to coming to recitation and lab. Make sure you budget your time each week wisely so that you are prepared for lab! Make sure that you have **studied the lab procedure section** of the experiment notes before coming to lab!

## Course Structure and Conduct

You will be assigned to a weekly 1¼ hour recitation/lecture and a 2½ hour lab session (no more than 9 students in the lab session). I will try to set up the sessions so that each meets in the afternoon, 1:00 – 4:30PM or thereabouts, but we may need a morning session or two. In lieu of an Organizational Meeting the first week of the term, you will fill out a [Physics Lab Scheduling Form](#) but and email it to Frank ([rice@caltech.edu](mailto:rice@caltech.edu)). The info will be used to set up the session times.

Frank will use the recitation/lecture session to go over the week's reading and prelab assignments and talk about the experiment session's lab work. **Students will submit their solutions to these exercises via email on paper at the beginning of the recitation/lecture session.** The in-lab session will involve the construction and testing of various circuits, often including some circuits of the student's own design. Each student will work independently with occasional help from the course instructor and the session's TA and assistant TA. You must keep **very brief** notes of the circuits constructed and the tests conducted on them, including oscilloscope screen captures, frequency response measurements, and possibly photos of the setup. You will submit your completed lab write-up to the lab session TA for grading a couple of days following the section. Most of the lab results should be recorded during lab, so **you should need very little time to finish the lab writeup** before handing in your work for grading. Your TA will provide specific instructions regarding when lab results write-ups will be due and where they should be turned in.

Experiments 1 through 7 will each require one lab session (week) of work. The Experiment 1 session begins the second week of the term (see the schedule on the first page of this document). Experiment 8, work on which begins Thanksgiving week in November, is a final project of the

student's own choosing and design. All student projects will be presented during a "marathon" final lab session (combining all sections) just before finals.

***Ask questions during recitation and during the lab!*** Don't just sit and stare helplessly at a circuit or piece of test equipment which stubbornly refuses to cooperate! The experiments cover much new material each week, and, probably, not all of it will soak in sufficiently on a first reading without some help from the lab instructor and TAs.

## Grading

Graduate students are encouraged to take Ph-105 Pass-Fail!

The course grade will be based on the number of points a student achieves out of a maximum total of 100 for the entire suite of 8 experiments. The final course letter grade assignment will be on a curve, but will roughly follow the traditional scheme that 93 or above is an A, 90–92 A–, 87–89 B+, etc. The curves for the various sections will differ so that all letter grades are assigned equitably. An A+ may be awarded to one or two students whose performance is truly exceptional.

**The assignment of numerical grades for each experiment (including the project) will be tailored to each individual student**, because each student starts the course with a different background and preparation in electronics and circuit design. *Hard work and notable improvement in your skills with circuit design and lab work will ensure that you get a good grade regardless of how advanced your classmates may appear to be.*

**Each of the Experiments 1 through 7 is worth 10 points.** Up to 4 points can be awarded for your preparation before lab, including the solutions to the prelab exercises, performance during recitation, and preparedness to conduct the in-lab experiments. The other 6 points are awarded based on the student's progress during the experiment portion of the lab, effectiveness at completing the lab tasks and measurements, and understanding of the circuits as indicated by their performance in lab and their recorded results.

**Experiment 8 (the final project) will be worth a maximum of 30 points.** The more that the circuit's design includes original work done by you, the more points you may expect; the greater the variety of concepts adapted from the previous weeks of experiments, the more points you may expect. More details concerning project grading will be provided as the time for it approaches.

Following the project presentations (Experiment 8), the course instructor and TAs will meet to discuss each student's final grade; at this meeting **letter grades will be balanced and normalized**

among the various sections so that everyone is evaluated fairly and assigned the appropriate letter grade.

## Collaboration Policy

**Students are encouraged to study the experiment materials together in preparation for lab.** Help each other to understand the concepts and circuits being presented and discuss how to approach the prelab exercises.

Each student must write up solutions to the prelab exercises independently, however, and may not consult another student's solutions when attempting to solve them. You may not refer to solutions from a previous year or solutions posted online.

During lab you are encouraged to **occasionally** assist your fellow students with use of the lab equipment (such as the oscilloscopes) or software as well as in understanding their results. Give them a chance to use the equipment themselves, however, and to learn from their mistakes. Do not fail to complete your own work because you are "babysitting" a fellow student's efforts!

Students must complete their lab write-ups independently, but they may discuss their results with fellow students and get help interpreting them. Any questions concerning this policy should be directed to your TA or the course instructor.

The policy for collaboration with other students during the final project phase will be discussed with the lab instructor when the projects begin.

## Late Policy

You must attempt to answer all prelab exercise questions before attending that lab's recitation. You may not attend recitation first and then complete the exercises, nor wait to attempt an exercise during recitation.

**If you have a conflict during your assigned recitation time, you may attend another recitation session if it meets before your lab period.**

**Students are required to successfully complete all 8 experiments to complete the course.** If a lab session must be missed, then the student should inform his or her TA beforehand and work out a schedule for completing the missed experiment. If at all possible, the student should arrange to attend a different lab session the same week, or, as a last resort, only the recitation portion of such a lab session.

**You must show up to the lab session on time** — failure to do so will result in a loss of some credit for that experiment. Repeated late arrivals will result in an ever-increasing penalty. If you cannot submit your lab write-up for an experiment on time, you must arrange this beforehand with your TA (an email to your TA in the wee morning hours doesn't count!). Unexcused failure

to turn in your lab write-up will result in a loss of some credit. Repeated failures to submit work on time will result in an ever-increasing penalty.

If you become ill or you must quarantine, let the course instructor know as soon as you can. We'll work something out to help you keep up with the course material!