Overview:

The course emphasizes understanding the basics of electricity and magnetism and their practical applications. To foster class participation, there are three section meetings per week. Adequate preparation on your part is required to benefit from the small class setting. Your job includes: reading the assigned sections of the text in advance of class, preparing questions of your own, doing the labs, and doing homework problems.

There is one lecture per week, consisting of demonstrations and their discussion. You will see examples of phenomena and illustrations of basic concepts. The emphasis is on the qualitative thinking needed to organize your approach to the problems you will encounter.

The texts for the course are *Physics for Scientists and Engineers, volume 2*, seventh edition, by Serway and Jewett, and *ZAP!,* your guide to the lab assignments, which you will pick up with your tool kit and parts assortment. The course handouts will be distributed in section and will available in 110 E. Bridge. This information sheet, the reading and homework assignments, and other handouts are also available from the course Web page, which you can get to from http://www.pma.caltech.edu/physicscourses.html. This, in turn, is easier to remember as the PMA Division “Physics Courses” page, which you can get to by following the chain: Caltech (home) → Academic Divisions → Physics, Mathematics, and Astronomy → Home → Physics → Physics Courses.

Laboratory Work:

A major difference between this quarter and last is that laboratory investigations performed outside the classroom are an essential part of the course. This will be about 1/3 of the total work that you will be asked to do. There are three main purposes for this hands-on activity:

1. Abstract electrical concepts will become more real and a part of the intuitive scientific knowledge you will use for creative research or engineering.
2. You will meet and become familiar with basic electronic technology, which is a mainstay of all research labs and much of the everyday world.
3. You will get experience in solving real-world experimental problems, which, unlike textbook problems, are multifaceted and open-ended. As predicted in *ZAP!,* “you will find yourselves becoming designers, inventors, and doers.”

This is a tall order for 1/3 of twenty weeks’ work, and the experiments may sometimes seem to be too demanding or to require too much time. Unlike homework problems, they are typically open-ended. They are also designed to provide a challenge to all of you, even those with quite a bit of previous experience. You need to manage your time and get from them what they can best offer you personally. The grading will allow for this.

On the afternoon of Wednesday, January 9, from 3:30 to 5:30 pm, you will need to pick up a carton in 308 E. Bridge, containing a tool kit, the parts to be used for experiments during the next two quarters, and *ZAP!* You will be asked to sign a quad form to buy your tools for about what a textbook costs. **Be sure to have your student ID number with you.** (This is roughly half the wholesale price of the materials; the cost of the remaining parts is contributed by the physics department.) There are about 100 items — perhaps a bewildering array. By June, you will be
familiar with all of them. In addition to electrical gadgets, you will also notice a few low-tech items like Styrofoam, razor blades, and Scotch tape for creative mechanical engineering.

Each week, there will be an assigned experiment, to be written up in a standard spiral notebook (included with your parts and tools) and handed in at class on Wednesday. **It must be handed in at the class and on time to receive credit toward your final grade.** Your notebooks will be read by the TA’s and returned to you in section on Thursday. Notebooks that are turned in on time and that indicate sufficient effort was expended will be given a grade of 3, 2, 1, or I. A “3” will be assigned to write-ups that are complete and well-documented and indicate an understanding of the material. Note that to receive a “3” you need not necessarily get all parts of the experiment to work; however, you must document well what you have done and interpret your results (even if they do not match expectation). A “1” is still a “passing” grade for the particular experiment but clearly below the level of work overall needed to pass the course. An “I” means your work on the particular lab is incomplete: the lab must be redone or continued to correct errors or address issues as specified by your TA. Upon completion of the lab, you will be given a numerical grade. There is no penalty for an “I” that was subsequently satisfactorily addressed. If your notebook is turned in late or if the write-up indicates that little effort was expended, you will receive a 0, i.e., no points will be awarded. Note that **in order to pass the course, EVERY lab must be satisfactorily completed before the end of the term.** This requirement to complete all the labs satisfactorily is separate from the earning of points toward your final grade. In particular, while late work or initially half-hearted efforts to complete an “I” will earn zero points, all labs must nevertheless (eventually) be completed satisfactorily to pass the course.

To help with difficulties you may encounter, we have an evening Help Lab. David Politzer and grad students Ersen Bilgin and Isaac Kim will staff it. At least one of them will be there: Tuesdays from 8:00 to 11:00 pm and on one other evening each week from 8:00 to 10:00 pm — to be determined on the basis of student demand. They will also provide spare parts and informal physics talk when the number of people who need help is not too great. The spare parts cabinet can be accessed at any time; the room opens with a South Campus Master. (Politzer will typically be there for the Tuesday evening session — although perhaps only until 10:00 pm; you are free to consider that as his “office hours” and bring any questions or comments you might have about Ph 1 Prac.)

**Homework:**

Problem sets are due each Thursday in class. They must be handed in on time to receive credit. In case of illness or other valid excuse, you and your TA can negotiate a modified due date. **The work must be your own and not copied from a group effort or a friend’s write-up.** You can seek out help and discuss the problems with anyone — to an extent you find productive. However, you should not consult anyone’s written, completed work, and your write-up must be all yours. A good guideline is that you should understand the problems well enough to be able to reproduce on your own any solution that you hand in. In the past, some students have achieved high homework grades yet fared poorly on tests and even failed the course. This shows poor judgment in using help. Try to find your own best way, so that you end up really learning the material. Remember that the difference between half and full credit on a single homework problem amounts to little more than $\frac{1}{10}$% of all the possible points available towards your final total. Instead of viewing each homework problem as a way to accumulate credit, think of it as an opportunity to focus your attention on the challenge of mastering the material of the course. The problems designated “QP”, if you work them on your own, can be particularly valuable as a way of anticipating the kinds of problems likely to appear on quizzes and the final exam.

Your other homework is to prepare for class on Monday and Thursday by reading the assigned sections in the text and noting your questions and comments. For each class, you should be prepared with at least one question or comment on the reading that you will be able to bring up in class discussion.

_Because your TA may choose to devote class time to particularly interesting or difficult topics and to pursue students’ questions and comments further, there might be some important topics not completely_
covered by all sections. Hence, the assigned sections of your textbooks are essential resources as the systematic outline and exposition of the course material. Use them.

Exams:

The last lab experiment of the term will be a lab quiz. It is to be done by yourself, and it will be graded. Since it is difficult to make up good new labs, we always use the same Experiment 8. Please do not look at or discuss past work on this experiment by other students.

There will be seven take-home quizzes and a final exam. These may cover material from the textbook, homework, labs, or lecture demonstrations.

Grades:

Of the total of 100 points, divided as follows, 50 will be required to pass.

- Lab notebooks: 21 (but all experiments must be completed satisfactorily to pass the course)
- Written homework: 10
- Lab quiz: 5
- Written quizzes: 35
- Class participation: 4
- Final exam: 25

Lab notebooks will earn 1 to 3 points each week for a passing write-up handed in on time or an incomplete lab made up the following week. 0 points will be awarded for a passing lab handed in late or a failed lab made passing at a later date. The lab work is an essential part of the course and cannot be substituted by good scores on the other parts. All lab experiments, including the Lab quiz, must eventually be completed with a Pass. Those who don’t complete them during the term will receive an E for the course and be required to complete them later.

It does in rare instances occur that a student’s nascent trouble-shooting skills are not quite up to the manifold possibilities of the real-world projects, e.g., burned fuses, bad connections, reversed parts. While we do encourage you to seek help in such instances and hope that you will be motivated to get things right, three hours of well-documented effort shall generally be deemed adequate for a minimal pass on a particular week’s lab work. “Well-documented” is a key phrase here: your lab notebook must contain an adequate description of what you did, what happened, and what you tried to remedy the problem. On the other hand, some of what you are asked to build will be needed in future weeks’ experiments. So you must eventually get those parts of the projects to work satisfactorily to earn a Pass.

Your recitation section TA will award 0 – 4 points for class participation (as distinct from “attendance,” which is a necessary but not sufficient condition for participation).

Switching Sections and Overload Petitions:

Switching sections will require the signature of the TA whose section you wish to join. Because the sections emphasize discussion and feedback on your lab work, it is important that there actually be adequate room in the section to which you transfer. Overload petitions require your TA’s signature if the conflict is with a section time and Politzer’s signature if the conflict is with Friday lecture.

1/7/08