Ph136: Applications of Classical Physics

(Dated: September 26, 2011)

I. COURSE DESCRIPTION

This course has been taught at Caltech since the 1980s by various faculty, initially based on notes of Kip Thorne, later on drafts of a textbook by Kip Thorne and Roger Blandford. At this moment, Kip has retired from teaching at Caltech (although he still makes frequent appearances at Caltech), and Roger has moved to Stanford. Kip and Roger are working hard trying to finish this draft soon for publication.

This course introduces the fundamentals of all the major branches of classical physics, in a way that builds on classical mechanics, classical electrodynamics, and elementary thermodynamics. Subjects covered by this course include: special relativity, statistical physics, optics, elasticity, fluid dynamics, plasma physics and general relativity. The course aims at: (i) giving the students a clear understanding of the basic concepts and principles of classical physics, and (ii) teaching the students how to apply classical physics. These aims will be realized by going through a lot of examples in many branches of physics, which may seem overwhelming — yet will turn out to be manageable, because the fundamental concepts and basic techniques are limited — they will be applied over and over again.

II. INSTRUCTOR, TEACHING ASSISTANT AND COURSE WEBSITE

- Instructor: Yanbei Chen
  - 318 Cahill, x4258, yanbei@caltech
  - Office hours: Monday, 4:00 PM to 5:00PM.
- TA: Huan Yang
  - 3?? Cahill, huan@caltech
  - Office hours: Tuesday PM.
- Course website: *http://www.pma.caltech.edu/Courses/ph136/yr2011/*

III. TEXTBOOK

The entire textbook is available on the web, at the course website. The version we have now is the most recent version provided by Kip. Chapters labeled "11XX" are the most updated version of 2011, while those labeled "10XX" are 2010 versions. Kip will try to update the chapters ahead of our schedule, so we will be using "11XX" versions as the time comes. Because of this live update, please pay attention to the version number of the draft you are reading.

Since Kip and Roger plans to get this draft published soon, they request feedback from all class members, so they can make improvements. Please email Kip your feedback to *kip@caltech*.

IV. HOMEWORK AND GRADES

A. Homework

Homework problems will be uploaded to the website every Wednesday night, and will be due the following Wednesday at 1 PM. You can turn in your homework either before the lecture, or to the TA's mailbox at 351 Cahill. Solutions to the homework will appear on the course website that afternoon.

Many of the same problems have been used in previous years (decades); for them there are many copies of solutions on campus. You are not allowed to consult those prior-year solutions until after your own homeworks have been turned in. We take very seriously this rule and press for its enforcement under the Caltech honor system.

On the other hand, you are encouraged to discuss the problems with each other, and work on them jointly, while you are trying to solve them, with the proviso that after the discussions you must write up your solutions yourself, independently of anyone else. Such collaborative problem solving is sometimes a more effective way to learn than struggling with an intractable problem by yourself. A wise student will take a mixed strategy: some work done alone, other collaboratively.

B. Grading

The default course grades will be Pass-Fail for all students. Students who wish to switch to the ABCDF system can do so by petition through the registrar's office, plus personal arrangement with me.

The course grade will be based on homeworks and a final exam in the following manner. Students who score 60% or more on the homeworks will pass the course without having to take the final. If they do not take the final, their grades will be P for people graded PF, and for people with letter grades: homework scores above 90% - A; between 75% and 90% - B; between 60% and 75% - C; below 60% - F (with $\pm$ added for undergraduates by interpolation). Students who are failing on the basis of homeworks and those who wish to improve their letter grades must take a final examination drawn from 50 elementary questions which will be distributed for study a few days in advance. Eight of these questions must be answered closed book. In this case the homeworks and the exam will both influence the final grade – with the proviso that the exam will never be used to diminish a grade. (Past experience has demonstrated that the easiest way to master the material and to pass the course is to do at least three-quarters of the homework.)