

Physics 129a
Fall 2009
Course Notes
Revised 91009

Notes about course:

- Physics 129a is devoted to what may loosely be called “analysis”. Physics 129b is devoted to “group theory” as used in physical applications. Finally, Ph 129c is devoted to probability and statistics.
- The book titled “Mathematical Methods for Physics and Engineering”, by Riley, Hobson, and Bence, is the text for Ph 129a. This is a large tome, and I am making it “suggested”, rather than “required”. I will provide course notes on the topics we will cover. These will be available on the web page for the course, and are the “required” text. However, I believe that some students like to have a real published work to refer to, hence the suggested text.

The material in Riley, Hobson, and Bence may be categorized, for Ph 129a as:

- Material that should be mostly familiar already: This includes much of chapters 1-12, as well as the introduction to complex variables in chapter 24.
- Material that you may not be familiar with, but is not part of Ph129 a (though may be part of Ph129 b and Ph 129c): This includes the material on tensors and group theory in chapters 26 and 28-29; the material on numerical methods in chapter 27, and the material on probability and statistics in chapters 30-31.
- Material that is part of Ph 129a: This includes the remaining chapters, with some additions and subtractions.

You may also wish to refer to any of a large number of other books on mathematical methods in physics. Examples include Matthews and Walker, Afken, and Butkov. I’ll mention some other resources as we go along.

- Grades will be entirely on homework, that is, there will be homework sets as usual instead of a midterm or final.

- Homework will be handed out Wednesday, due the following Tuesday (with the exception of the first problem set, which is due Wednesday, Oct. 7). Please turn the homework in to the appropriate TA (see below) mail slot on the fourth floor of Downs.
- Collaboration policy: OK to work together in small groups, and to help with each other's understanding. Best to first give problems a good try by yourself. Don't just copy someone else's work – whatever you turn in should be what you think you understand.
- There is a web page for this course, which should be referred to for the most up-to-date information. The URL:
<http://www.hep.caltech.edu/~fcp/ph129/>
- TA:
 - Even-numbered problem sets: Hee-Joong Chung hjchung@caltech.edu
 - Odd-numbered problem sets: Chan Youn Park splendid@caltech.edu

Both TAs will have office hours in 413 Downs, on Mondays, 4:00PM to 6:00 PM.

- I may have solutions to some of the problems somewhere on my web site. Do not look at these until after you have turned in the problem set!

Here is a brief outline of the topics I plan to cover in Ph 129a:

1. Integral equations and transforms
2. Linear spaces, operators
3. Sturm-Liouville theory
4. Special functions
5. Green functions
6. Introduction to distribution theory
7. Calculus of Variations
8. (Optional) Measure theory, Lebesgue integral

The optional item depends on time and class interest.