

Physics 115A

Spring 2006

Professor: Steve Carlip

Room 437 (Physics-Geology)

Office hours TW 11-12 (or email for an appointment: carlip@physics.ucdavis.edu)

TA: TBA

Office hours TBA

TA/grader: TBA

Office hours TBA (for questions about grading)

Required text:

D. J. Griffiths, *Introduction to Quantum Mechanics, second edition*

Griffiths gives a good, focused explanation, and is generally considered to be clear and well-written; it is probably the most widely used undergraduate textbook. But it contains relatively few examples or worked-out problems, and some key points are left as exercises. I will put several other texts on reserve at Shields; see list on back.

Supplementary text:

N. Zettili, *Quantum Mechanics: Concepts and Applications*

This book contains a large collection of examples and problems. While it will not be used directly in class, it is a very nice source for sample calculations, etc.

Web site:

The class Web site may be reached through the Physics Department site, <http://www.physics.ucdavis.edu/>. Look under “course websites.”

Grading:

Homework 35%

Midterm 25%

Final 40%

Late homework will be accepted, but with a substantial deduction in the grade. (You need to keep up with the homework in order to understand the course!)

Rough course plan—details will certainly change over the quarter

(“G x” means “Griffiths section x”)

March 29-April 5	Wave functions and the Schrödinger equation (G 1.1-1.4, Prob. 1.14)
April 7-14	Momentum, operators, uncertainty principle (G 1.5-1.6, Prob. 1.7)
April 17-24	Stationary states, infinite square well (G 2.1-2.2)
April 26-May 1	Harmonic oscillator (G 2.3)
May 3	Free particle (G 2.4)
May 5	Midterm
May 8-12	Other simple potentials; the scattering matrix (G 2.5-2.6, Prob. 2.52)
May 15-19	More math: linear algebra, Hilbert spaces, operators (G 3.1-3.3)
May 22-24	Math and meaning (G 3.4-3.5)
May 26	Dirac notation (G 3.6)
May 31	Two-state systems (G Example 3.8, possible extras from <i>Feynman Lectures</i>)
June 2 and 5	Fun stuff: EPR paradox, Bell’s inequality (G 12)
June 7	review
June 14	Final exam

Some general advice:

The course assumes basic knowledge of calculus and of mathematical methods in physics, as well as classical mechanics (including the Hamiltonian formulation). If you have trouble with the background material, please see me.

It would be a *very* good idea for you to read ahead—use the outline on the front of this syllabus and be sure to read each section *before* it is the class topic. The class Web page will have a regularly updated set of reading assignments.

In my lectures, I will assume that you have done and understood the homework. If you get stuck on a point, there are lots of office hours available. If you get stuck and you think you are not alone, though, tell me—it may mean that I should cover some issue in more detail in lecture.

Books on reserve (tentative):

1. Saxon, David, *Elementary Quantum Mechanics*
2. Liboff, Richard L, *Introductory Quantum Mechanics*
3. Ohanian, Hans C, *Principles of Quantum Mechanics*
4. Cohen-Tannoudji, Claude, *Quantum Mechanics*
5. Zettili, Nouredine, *Quantum Mechanics: Concepts and Applications*
6. Bransden, B H, *Introduction to Quantum Mechanics* (if the library can find their copy)
7. Griffiths, David J, *Introduction to Quantum Mechanics*
8. Silverman, Mark P, *And Yet It Moves: Strange Systems and Subtle Questions in Physics*

Two thoughts to keep in mind when you get confused during this course:

“Because atomic behavior is so unlike ordinary experience, it is very difficult to get used to, and it appears peculiar and mysterious to everyone—both to the novice and to the experienced physicist. Even the experts do not understand it the way they would like to, and it is perfectly reasonable that they should not, because all of direct, human experience and of human intuition applies to large objects. We know how large objects will act, but things on a small scale just do not act that way. So we have to learn about them in a sort of abstract or imaginative fashion and not by connection with our direct experience.”

– Richard Feynman

“Anyone who is not shocked by quantum theory has not understood it.”

– Neils Bohr