PHY 4605
Wave Mechanics II
Spring 2005

Course time and location
MWF, 12:30-1:20pm
MAP 306

Textbook
Richard L. Liboff
Introductory Quantum Mechanics, 4th Edition
Addison-Wesley, Reading MA
ISBN 0805387145

Instructor
Patrick Schelling
Asst. Professor
Office: MAP 305E
Phone: 407-823-1884
Fax: 407-882-1462
Email: pschell@mail.ucf.edu
Office Hours: MW 1:30-3:30pm

Grading
25% Homework
10% In-class group exercises
20% Midterm 1
20% Midterm 2
25% Final Exam

Approximate Grades (no plus/minus)
80-100 A
70-79 B
60-69 C
50-59 D
<50 F

Homework
Assigned every Wednesday,
due following Wednesday. You may work together, however it is recommended that you try on your own first. Also, your final product must be your own work in your own handwriting.

In-class group “quiz”
Last half hour or so, every Friday. Like a quiz or homework, but done in groups of three people.

Midterms and Final Exam
These will be open book (only Liboff), and a calculator is permitted.

Important Dates:
Monday, January 9 First day of classes
Monday, January 16 Martin Luther King day, no class
Friday, February 10 Midterm #1, Chapter 9.1-9.3,10
March 13, 15, 17 Spring Break, no class
Friday, March 31 Midterm #2, Chapters 9.4-9.5,11,12
Monday, April 24 Last day of class
Friday, April 28 10:00-12:50pm, Final Exam, Chapters 9-13

Objectives and Expectations:
This course continues the study of quantum mechanics from PHY 4604. You need to be expert in the material from PHY 4604 in order to succeed. In this course, you will begin to apply what you have previously learned, along with some new concepts, to several important problems. Somewhat in contrast to the PHY 4604, where we spent a lot of time developing the basic framework of quantum theory, in this course we will apply quantum theory to problems where comparison to experiment demonstrates some of the many
impressive successes of quantum mechanics.

We will extend our study to problems in three dimensions, which adds the important concept of orbital angular momentum. This will allow a comprehensive study of the hydrogen atom. We will also introduce the important concept of spin, which is an intrinsic property of particles and hence is somewhat different from orbital angular momentum.

Matrix mechanics will be introduced. This is an alternate yet equivalent way of formulating quantum mechanics. One of the applications will be to spin states of electrons and nuclei, including the interactions of the magnetic moment of a particle with a magnetic field.

Finally, the important topic of perturbation theory will be studied. This is important for obtaining approximate results for problems that are difficult to solve exactly. However, the most important application of perturbation methods is for studying time-dependent problems where Fermi’s Golden Rule is commonly used to compute transition rates.

We will cover most of the material from Chapters 9-13, and briefly touch on Chapter 14. However, it is likely that some sections, especially from Chapters 11-13, will have to be skipped due to time constraints.

Reading assignments will be given out at each lecture, and these should be completed before the following lecture.

**Additional books/resources**

Some other books you might find useful include the Quantum Mechanics book by Gasiorowicz, and at a slightly more advance level “Modern Quantum Mechanics” by J.J. Sakurai. Especially for this course, the Introduction to Theoretical Methods course (PHZ 3113) is useful to review. Many of the mathematical techniques we will use can be found in for example “Mathematical Methods for the Physical Sciences” by Boas and at a slightly higher level in “Mathematical Methods for Physicists” by Arfken.

Make-up/Late work. This is the policy of the Department, and we are required to follow it:

Make-up policy: There will be **no makeups** of homework, midterms, or the final exam. The only exception is in the case of 1) medical emergencies, 2) UCF business/travel, and 3) religious holidays. Documentation for these is required.