PHYSICS 384: QUANTUM MECHANICS II

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INSTRUCTOR

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TEXT

D. J. Griffiths, Introduction to Quantum Mechanics, Prentice Hall, Englewood Cliffs, 2nd edition.

OBJECTIVES

In this second part of quantum mechanics we will cover selected chapters from the textbook. We will develop from our basic knowledge of quantum mechanics further theory and applications. We will explore operator manipulation, matrix technique, and various approximation methods. Selected applications in atomic and optical physics will be addressed.

FORMAT

Lectures will present the main ideas of the course and include the topics that deserve emphasis. Apart from reading the text, it is essential that you do many practices. You will be given many opportunities to do so. The regular homework will be exercises related to or compliment of the classes. The computer projects will be hands-on opportunities for you to work out numerical results. They should help you in getting a better view of what's going on. All these exercises are very important.

MATHEMATICS

We will be encountering calculus, complex numbers, linear algebra, matrices, and partial differential equations. It will be a good idea to review the relevant part as we go along.

GRADING

The final grade will be based on your performance in two exams, a final exam, 3 homework assignments, and two computer projects. The breakdown will be as follows:

Exam 1	23 %
Exam 2	23 %
Final Exam	23 %
Homework	21 %
Computer Projects	10 %

The exams and final will be close-book but one 8.5"×11" sheet of paper that you think will help you with difficult *equations* will be permitted. I will make a math handbook available too. The high boundaries for the letter grade are A≥90%, B≥80%, C≥70%, D≥50%.

LATE HOMEWORK AND ABSENCES

Make-up exams will be allowed only for excused absences due to serious illness, death in your immediate family, or other significant reasons. Make-up exams will not be the same but similar to the regular exams. Homework will be collected on the announced due date. Late homework will lose

points 16% daily. Incomplete homework will be given partial credit. No homework will be accepted after the solutions have been discussed.

HOMEWORK AND COMPUTER PROJECTS

I will assign theoretical homework regularly. I will also assign computer projects. The solutions that you hand in should include a brief description of what you did, program listing, appropriate graph or data outputs. The program source file should be emailed to the instructor separately (the login name is qcsu on meitner). The programs should be well organized and clearly commented on each part. Typed homework is encouraged.

Up to this point you are probably quite use to the computer assignments in this department. New algorithms and techniques for the assignments will be discussed in the assignment or in class or the assignments. You are expected to write out the programs on your own. The language will be FORTRAN and the machine will be meitner. Anyone who has not an account should let me know. We will be using popular softwares of the department, g95, terminal (for mac users), kaleidagraph (for mac) and Mathematica. We may not use them all. An introductory manual about the use of the local computers and the above softwares is around in Moulton 308.

Quantum Mechanics is not an easy subject. Sometimes it is counter-intuitive and abstract. For this reason you may have problem working out the assignments in the required time. In case you encounter such a problem, discuss with classmates or instructor and get some useful hints from them. Independent work will be essential and copy will be prohibited.

MISCELLANEOUS

Homework and test solutions will also be discussed in class.

POSSIBLE TOPICS

Below is a tentative list of the topics to be covered. I will be happy to adjust them to meet your needs.

Topics

Wave function and operators
Heisenberg vs Schroedinger pictures
Matrix representations
Dirac notation

Identical particles
Two particle systems
Simple models of solids
The variational principle

Time independent perturbation theory
Hydrogen fine structure
Time dependent perturbation theory
Quantum transitions in few-level systems