

# PHY362K Applications of Quantum Mechanics

## First Day Handout Spring 2016

Class Meetings: Unique number 55960 (TTh 11:00-12:30) RLM 7.104

**Instructor:** Greg O. Sitz, Office: RLM 10.313, Office Hours: W 10:00-11:30, Th 2:00-3:00 or by appointment. Phone: 471-0701, email: [gositz@physics.utexas.edu](mailto:gositz@physics.utexas.edu)

**Grader:** TBA

**Prerequisites:** PHY373, Quantum I. This will be enforced, for good reason.

**Text** - *Introduction to Quantum Mechanics* Second Edition, by *David J. Griffiths*. (The first edition should work, but a few problems may be assigned out of the book, and there is no guarantee that they are the same between the editions.) The material covered and the order in which it will be covered are shown on the next page. A free alternative is Richard Fitzpatrick's book covering many of the same topics, which can be accessed at:

<http://farside.ph.utexas.edu/teaching/qmech/qmech.html>.

**Grading** - The breakdown is: Homework 20%, In-class exams: 40%, Final Exam 40%. Homework and test scores will be weighted as just described and a composite score ( $S$ ) of between 0 and 100 for the course will be calculated. The final grades for the course will be determined using this composite score as follows:  $S \geq 85 \Rightarrow A$ ;  $85 > S \geq 70 \Rightarrow B$ ;  $70 > S \geq 60 \Rightarrow C$ ;  $60 > S \geq 50 \Rightarrow D$ ;  $50 > S \Rightarrow F$ . The composite score will not be rounded, that is 84.99 is less than 85. Plus/Minus grading may be used for final scores close to the cutoffs given.

- **Homework - 20% of grade** - Homework will be assigned approximately weekly during the semester. All homework assignments will be weighted equally (even though they may cover different amounts of material and have different numbers of problems). The lowest score will be dropped in computing the average.
- **In-class Exams - 40%** - Two in-class exams will be given: dates are March 3 and Apr. 21. Each will be worth 20% of your final grade.
- **Final Exam - 40%** The final is comprehensive and it is *required*. It is scheduled for Tuesday, May 17, 9:00-12:00 noon.
- **Journal - 5% Bonus** A weekly question, essentially a participation bonus.

The exams will be closed book and closed notes, and no calculators or other aids of any type are allowed. A cover sheet with relevant formulas and constants will be provided. This cover sheet will be available in advance of the exams. The final exam will be cumulative, and the best way to prepare for the final is to keep up with the material as it is covered in class. This means being prepared for and taking the in-class exams.

**Discussion Session:** each Monday from 5-6:30 in RLM 7.114. Optional.

**Academic Dishonesty:** You are encouraged to seek and provide assistance freely in working on homework assignments. However, the work that you submit should clearly be your own. DO NOT COPY from any source and submit it as your own work.

**Other:** The last day to drop the course for academic reasons is April 4, 2016.

If you are absent for the observance of a religious holy day you may complete the work missed within a reasonable time after the absence, if proper advance notice has been given.

Unless a *substantial* illness or family emergency is documented with a note from a physician or the dean's office, no make-up exams will be given. Any potential absences must be discussed with Dr. Sitz *prior* to the exam in order to have a make-up.

The University of Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, see:

<http://www.utexas.edu/diversity/ddce/ssd/>

or contact the Office of the Dean of Students at 471-6259.

**Alternatives:** This document (as well as other course related material, including homework and test scores) will be available on Canvas.

## Syllabus

(probable, but subject to change)

Week of January 18:	Review, Perturbation Theory (Griffiths, Section 6.1)
January 25:	more Perturbation Theory, examples (Griffiths, Section 6.1)
February 1:	degenerate Perturbation Theory, fine structure (Section 6.2, 6.3)
February 8:	Zeeman effect (Section 6.4), and Hyperfine structure (section 6.5)
February 15:	perturbation theory continued
February 22:	Time Dependent PT (Chapter 9)
February 29:	continued (Supplemental material) and Test 1 on 3/3
March 7:	Variational principle (Section 7.1)
March 14:	Spring Break
March 21:	Variational principle, examples
March 28:	Helium atom (Supplemental material)
April 4:	multi-electron atoms (Section 7.2)
April 11:	Hydrogen molecule ion (Section 7.3)
April 18:	more molecules (Supplemental material) and Test 2 on 4/21
April 25:	solids or scattering (Supplemental material)
May 2:	solids or scattering (Supplemental material)

## Quotes

"I think I can safely say that nobody understands Quantum Mechanics" -R. P. Feynman

"It is often stated that of all the theories proposed in this century, the silliest is quantum theory. In fact, some say that the only thing that quantum theory has going for it is that it is unquestionably correct." - Michio Kaku

"If quantum mechanics hasn't profoundly shocked you, you haven't understood it yet." - Niels Bohr

"How often have I said to you that when you have eliminated the impossible, whatever remains, however improbable, must be the truth?" - Sherlock Holmes (Sir Authur Conan Doyle)

"The paradox is only a conflict between reality and your feeling what reality ought to be." -R. P. Feynman

"It appeared to me that hydrogen . . . more than any other substance is destined to open new paths to the knowledge of the structure of matter and its properties." -Johann Jacob Balmer (1884)

"Had I known that we were not going to get rid of this damned quantum jumping, I never would have involved myself in this business!" -Erwin Schrödinger

"those that can't do, teach, and those that can't teach, teach gym." -Woody Allen