PHYS 631: Quantum Mechanics I (Fall 2018)

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Course home page:

http://atomoptics-nas.uoregon.edu/~dsteck/teaching/18fall/phys631

Schedule: TTh 10-11:50a, 318 Willamette
Course reference number: 15082
Credits: 4
Prerequisites: none

Links: news, course notes, homework sets and keys.

Course overview

This course is a more-or-less standard introduction to quantum mechanics at the graduate level, one of the core components of your Ph.D. studies. This is the first of a 3-quarter sequence. This course will also assume you have studied quantum mechanics for at least one term at the undergraduate level.

Recommended Texts:

There is no required textbook for this course. I will provide my notes (either typed or handwritten, as time allows) for the course material as we go along. However, this material is covered well in many excellent texts. A few of the more widely used and/or interesting ones that you may want to have in your collection are:
Sakurai, *Modern Quantum Mechanics*
Merzbacher, *Quantum Mechanics*
Landau and Lifshitz, *Quantum Mechanics: Non-relativistic Theory*
Peres, *Quantum Theory: Concepts and Methods*
Dirac, *The Principles of Quantum Mechanics*

**Grades**

Grades for the course will be based on homework, a midterm exam, and a final exam. The relative weights will be as follows:

- Homework: 30%
- Midterm exam: 30%
- Final exam: 40%

**Homework:** about 6-8 problem sets will be assigned during the term.

**Midterm exam:** The midterm exam will be held in class on Tuesday, 30 October 2018 (during the sixth week of class).

**Final exam:** The final exam is scheduled for Monday, December 3, 8-10a (!), in 318 Willamette.

**Pass/fail grading option:** Since this is a core graduate course, you should take the graded option.

**Syllabus**

This is a tentative list of topics we will cover in this and the following course(s) in the sequence. Note that it is likely we won't get through all of this in one term.

1. Overview of mechanics in Hilbert space
2. Operators and expectation values; Uncertainty principle
3. Free particle
4. Square-well potentials
5. Probability currents and tunneling
6. Semiclassical approximations
7. Symmetries and conservation rules
8. Harmonic oscillator
9. Delta-function potential
10. Matrix mechanics, unitary transformations, time evolution
11.