Physics 5250: QUANTUM MECHANICS - I

Fall 2015

MWF 3-3:50pm, Duane G125 Instructor: Prof. Leo Radzihovsky

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Office Hours:	Mon, Wed 2-3pm (or by appointment), Gamow Tower, Rm F623, phone: 492-5436, email: radzihov@colorado.edu
Course Description:	This graduate course will cover standard topics in nonrelativistic quantum mechanics, as outlined below
Pre/Corequisites:	electricity and magnetism, classical mechanics, basic mathematical physics, interest and desire to learn
Text:	*Principles of Quantum Mechanics*, R. Shankar, Springer
Additional suggested reading/references:	• *Modern Quantum Mechanics*, J. J. Sakurai, Addison Wesley • *Quantum Mechanics*, L. D. Landau and E. M. Lifshitz, Pergamon Press • *Quantum Mechanics*, L. I. Schiff, McGraw-Hill • *Quantum Mechanics*, C. Cohen-Tannoudji, B. Diu, F. Laloe • *Quantum Physics*, Eisenberg and R. Resnik
Homework (60%):	Problem sets due every two weeks
Final Exam (40%):	tentatively Wed, Dec 16, 1:30-4pm

COURSE OUTLINE

1. Introduction
   (a) Classical mechanics
   (b) Conflict with experiments
   (c) Quantum mechanics ideas and coordinate formulation
2. Postulates and mathematical structure of quantum mechanics
   (a) Hilbert space
   (b) Hermitian operators
   (c) Measurement and probabilistic interpretation
   (d) Density matrix
   (e) Time evolution: Schrodinger, Heisenberg and Feynman formulations
3. Simple problems in one dimension
   (a) Free particle
   (b) Particle in a box
   (c) δ-function potential
   (d) Harmonic oscillator
4. Symmetries and their consequences
   (a) Translation in space and time
   (b) Parity
   (c) Time-reversal
5. Rotational invariance and angular momentum
   (a) Proper rotation
   (b) Angular momentum algebra
   (c) Spin
   (d) Addition of angular momenta
6. Applications
   (a) Harmonic oscillator
   (b) Hydrogen atom
   (c) Electron in a magnetic field
   (d) Spectrum and its degeneracy
   (e) Spin-orbit interaction