

# Physics 5260: QUANTUM MECHANICS - II

Spring 2008

MWF 11-11:50 am, Duane G125

Instructor: Prof. Leo Radzihovsky

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Office Hours: Mon, Wed 2-3pm (or by appointment), Gamow Tower, Rm F623,  
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Course Description: This graduate course (that is a continuation of Quantum-I, Phys 5250) will cover standard topics in nonrelativistic quantum mechanics, as outlined below

Pre/Corequisites: graduate Quantum-I, 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:

- *Quantum Mechanics*, L. D. Landau and E. M. Lifshitz, Pergamon Press

- *Modern Quantum Mechanics*, J. J. Sakurai, Addison Wesley

- *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 Tue, May 6, 10:30-1pm

## COURSE OUTLINE

1. Review basics of quantum mechanics (covered in Quantum-I)
2. Approximate methods and applications
  - (a) Variational theory
  - (b) WKB approximation
  - (c) Perturbation theory
  - (d) Applications
    - anharmonic oscillator
    - tunneling
    - double-well potential
    - periodic potential
    - dc and ac Stark shifts
    - dipole transitions
    - stimulated and spontaneous emission
    - Fermi's golden rule
    - Rabi oscillations
    - Landau-Zener transition
3. Scattering theory
4. Dirac equation
5. Path-integrals
6. Introduction to quantum field theory
  - (a) classical field theory
  - (b) phonons quantization
  - (c) electrons