Physics 125c: Quantum Mechanics Spring 2008

Outline *(Revised 3/4/08)*

This is a preliminary outline of the topics to be covered. The order and emphasis may change as I see how the term progresses, some topics may be left out and others added. I have given references to relevant sections in Shankar, although my discussion will not always follow his, and may be supplemented by other material. If you have comments or suggestions, please e-mail me.

1. Dynamics
    - Time dependent perturbation theory (Shankar §18.1-2)
    - Interaction of atoms with EM radiation (Shankar §18.4-5)
    - Schrodinger, interaction and Heisenberg "pictures" (Shankar §18.3)
    - Adiabatic dynamics and Berry's phase (Shankar pp592-607)
2. Scattering Theory (Shankar Chapter 19)
3. Simple Harmonic Oscillator Revisited
    - Raising and lowering operators (review, Shankar §7.4)
    - Coherent States (Shankar pp 607-10)
    - Quantizing fields (Shankar pp 506-21)
    - Cavity QED: atomic levels coupled to discrete EM modes
4. Path Integral Method (Shankar Chapter 8 and parts of Chapter 21)
5. Entanglement, Decoherence and Quantum "Paradoxes"
6. Bose-Einstein Condensation in Atom Traps
    - Atom traps and noninteracting theory
    - Interactions and scattering theory
    - Many particle systems, creation and annihilation operators
    - Dilute interacting Bose gas: Bogoliubov theory
7. Strongly interacting Bosons
    - Superfluidity in He^4
    - Application of path integrals
    - Quantum Monte Carlo
8. Interacting Fermions (time permitting)
    - Ideal Fermi gas
    - Superconductivity (very brief)