

**COURSE OUTLINE**

0. Details

- A. Instructor: P. Phillips, Rm. 2121 ESB, 4-2003,  
Office Hours: W, Th. 11:00-12:30
- B. Grader: Coskun Kocabas, Loomis 390N, M., F.  
9-10:00am
- C. Exams: Midterm and Final at end of term
- D. Texts: Baym, Shankar
- E. Reserve list is in library

I. Fundamentals of quantum mechanics

- A. 2-slit experiment: Uncertainty and Quantum Interference
- B. State vectors, Measurement, Superposition
- C. Operators, Eigenfunctions, Momentum and Position Representations
- D. K-Mesons, Schroedinger Equation
- E. Classical Correspondence, Ehrenfest theorem
- F. Amplitudes as Path Integrals

II. 1-dimensional Problems

- A. Particle in a Box
- B. One-dimensional Barriers,  $\delta$ -function potential
- C. Transmission and Reflection
- D. Tunneling
- E. Bound States and Resonances
- F. Impurity Scattering in a Crystal
- G. Phase Shifts, Optical theorem
- H. Harmonic Oscillator

III. Central Potentials

- A. Rotations
- B. Angular Momentum, Commutators
- C. Spherical Harmonics
- D. Hydrogen Atom
- E. Symmetry

IV. Stationary State Perturbation Theory

- A. Brillouin-Wigner vs. Rayleigh-Schroedinger Perturbation Theory
- B. Stark Effect in the Hydrogen Atom
- C. Stark Ladder in a Crystal, Electric Field Localization
- D. Degenerate Perturbation Theory
- E. Van der Waals Interactions

V. More on Scattering Theory

- A. Born Approximation
- B. Scattering Amplitude
- C. Friedel Sum Rule
- D. Coulomb Scattering
- E. Regge Poles