

PHYS 522

Quantum Mechanics II

Organization

The course will meet on Tuesdays and Thursdays 2:30-3:45 in HBH 22. Several lectures will be cancelled due to travel and extra class meetings may be scheduled. The dates and times for these classes will be determined in consultation with all students. Instructor: Peter Nordlander (Rm. BH308, nordland@rice.edu). Grader: Francisco Camargo (fc9@rice.edu).

Structure of the course

The course will consist of lectures and an extensive set of homework. At the end of the semester, there will be a final oral exam.

Text

“Quantum Optics” by M.O. Scully and M.S. Zubairy, selected chapters from “Quantum Electrodynamics” by W. Greiner and J. Reinhardt, and various handouts that will be distributed during the course.

Grading

The grade will be determined from the homework (90%) and final exam (10%).

Preliminary Course Content

Quantum Theory of Radiation
Coherent and Squeezed States
Quantum Distribution Theory
Field-Field and Photon-Photon Interferometry
Atom-Field Interaction: Semiclassical Theory
Atom-Field Interaction: Quantum Theory
Quantum Theory of Damping
Resonance Fluorescence
Quantum Theory of the Laser
EPR, Hidden Variables, and Bell's Theorem
Quantum Nondemolition Measurements
Quantum Optical Tests of Complementarity
The Quantum Measurement Problem
Propagators and Scattering Theory
Propagators for Electrons and Positrons
Quantum-Electrodynamical Processes
The Feynman Rules of QED
The Scattering Matrix in Higher Orders: The Lamb Shift
Quantum Plasmonics