DETAILED COURSE DESCRIPTION

Course Number PHYS 412

Course Title Introduction to Quantum Mechanics II

Target audience The course is designed for junior or senior level physics majors; however other engineering and science majors with the correct preparation are very welcome. Nb: this is a course that is NOT mandatory for all Physics Majors. Typically, but not always, this is a course whose audience is composed by students who intend to pursue graduate studies after the BS degree.

Prerequisites PHYS 411

Catalog description Methods of calculation: perturbation theory, the variational principle, and the WKB approximation. Introduction to scattering theory. Quantum statistics. Applications to atomic, molecular, nuclear, and condensed matter physics. This course is targeted toward students who intend to pursue graduate studies in physics.

Expected previous knowledge

Concepts wave/particle duality, photoelectric effect, Schrödinger equation, wave functions, simple problems, angular momentum, tunneling, electron spin, Stern-Gerlach experiment.

Skills Familiarity with calculus and calculus concepts (vectors, vector, differential and integral calculus), linear algebra (matrices, determinants etc.), differential equations (ODE).

Course Objectives

To familiarize students with the application of quantum mechanics to some specific physical systems.

Sample Text

"Introduction to quantum mechanics", David J. Griffiths, Pearson Prentice Hall.

Minimum Material Covered

Identical particles

Time independent perturbation theory

Time Dependent perturbation theory and the two level system

The Variational Principle

The WKB Approximation

Scattering in three dimensions

The Adiabatic approximation and Berry's Phase

Entangled states, the EPR paradox, and Bell's Theorem