Phys 486/686 - Quantum Mechanics II - 3 credits

Bulletin Description:

Continuation of Physics Phys 485. Angular Momentum, Spin, Angular Momentum Addition, Bosons and Fermions in Atoms and Solids, Quantum Statistical Mechanics, Variational Principle, WKB Approximation, Tunneling, Perturbation Theory, Emission and Absorption of Radiation, Scattering. Prerequisite: Phys 485

Course Objectives:

To master the foundations of quantum mechanics, including fundamental concepts, key experiments, theoretical methods, and practical applications to a variety of systems.

Content Listing:

- **Angular Momentum**: Spin, Addition of Angular Momenta
- **Identical Particles**: Bosons, Fermions, Atoms, Solids, Quantum Statistical Mechanics
- **Time-Independent Perturbation Theory**: Nondegenerate and Degenerate Cases, The Fine Hydrogen Structure, The Zeeman and Hyperfine Splitting
- **The Variational Principle**: The Helium Ground State, The Hydrogen Molecular Ion
- **WKB Approximation**: Tunneling, Wave Function Matching
- **Time-Dependent Perturbation Theory**: Two Level Systems, Emission and Absorption of Radiation
- **The Adiabatic Approximation** (if time permits)
- **Scattering**: Partial Waves, Phase Shifts, The Born Approximation
- **The Conceptual Issues**: The EPR Paradox, Bell's Theorem, The No-clone Theorem, Schrödinger's Cat, The Quantum Zeno Paradox (if time permits)

Text: D. J. Griffiths, Introduction to Quantum Mechanics, 2nd ed. (Pearson, 2005).