Phys 350 – Modern Physics I - 3 credits

Bulletin Description:

Breakdown of classical physics, special relativity, Bohr model, Schrödinger mechanics of simple systems, atomic structure. Prereq: Phys 252, Math 265.

Course Objectives:

This course introduces students to the limitations of classical physics and to the theories of quantum mechanics and special relativity which supersede the classical theory. Students will learn how to make predictions with classical theory, examine physical phenomena for consistency and then investigate what might be failing with the classical framework. Special relativity is investigated as an alternative to classical dynamics at high energies. Quantum mechanics is introduced in the context of adsorption/emission of radiation and in the limit of small objects. Students will master basic concepts of both theories, develop a greater understanding of algebra (special relativity) and differential equations (quantum mechanics).

Content Listing:

- **Classical Background**: Particles, waves, complex notation, wave equation.
- **Limits of Classical Mechanics**: Compton effect, double slit experiment, photoelectric effect, spectral emission, scattering, Bohr atom.
- **Quantum Mechanics**: Time-independent Schrödinger wave equation, wave functions, probability, the uncertainty principle, infinite wells, finite wells, simple harmonic potential, electric potential, the hydrogen atom, time-dependent Schrödinger wave equation, algebraic techniques and operators, scattering.
- **Applications of Quantum mechanics**: Lasers and Masers, population inversion.
- **Special Relativity**: Galilean transformations, Lorentz transformations, Lorentz contraction, time dilation, invariance in space time, velocity addition, Doppler effect, momentum and energy, conservation of momentum and energy.