Stephen F. Austin
STATE UNIVERSITY

PHY 512
Atomic Structure

Course Description

This is a graduate level course in advanced atomic structure. The goal is to give the student an in-depth understanding of the field.

Course Prerequisites

- Graduate Standing
- Introductory Quantum Mechanics (PHY 431)

Specific Course Requirements

Textbook Requirements

See current semester textbook list at http://www.physics.sfasu.edu/docs/books.pdf

Course Objectives

- Develop the statistical distribution laws from first principles
- Show the link between observed spectra and atomic theory
- Develop semi-classical models of the atom and how these models lead to quantum mechanics
- Develop the use of the four quantum numbers both from a comparison to the classic two-body problem and from the vector model of the atom

Student Learning Outcomes

By the end of the course, a successful student will be able to:

- Develop the statistical distribution laws from first principles.
- Associate observed spectra to atomic theory.
- Develop semi-classical models of the atom and show how these models lead to quantum mechanics.
- Identify the four quantum numbers both from a comparison to the classic two-body problem and from the vector model of the atom.

Course Content

- Statistical Distribution Laws
- Blackbody Radiation
- Bohr Theory for Hydrogen and Hydrogenic Atoms
- The Classical Two-Body Problem applied to Atoms
- Solution of the Schrödinger Equation for Hydrogen
- Heisenberg Resonance
- Quantum Numbers and Selection Rules
- Vector Model of the Multi-electron Atom
- Zeeman Effect
- Dipole Radiation

Course Assessment

The course assessment may use any or all of the following evaluation tools: exam scores, classroom participation, homework average, quizzes, and team projects.