

Introduction to Atomic and Nuclear Physics
750:403 01

Text: “*Modern Atomic and Nuclear Physics by Yang and Hamilton, World Scientific 2010 ISBN 13 978-981-283-678-6; ISBN 13 978-981-283-679-3 (pbk)*”

This course is an introduction to:

- * **The structure and properties of atoms and nuclei**
- * **Nuclear atom**
- * **Hydrogen atom**
- * Bohr/deBroglie model
- * Electron spin
- * Quantum theory
- * Lamb shifts
- * Fine and hyperfine structure
- * External fields.
- * **Many electron atoms**
- * Pauli principle
- * Multiplets
- * Periodic table
- * X-ray spectra
- * Vector coupling
- * Systematics of ground states
- * **Interaction of atoms with light**
- * Radioactivity
- * Nuclear forces and nuclear models
- * Nuclear reactions
- * Nuclear Energy, fission and fusion

This course is aimed at upper level undergraduate and early graduate students in physics, materials science, chemistry and engineering who desire or need a good understanding of the properties of atoms and nuclei.

The course assumes a basic understanding of quantum theory, though many aspects of it will be reviewed as required.

Homework will be assigned *weekly*, will be reviewed, collected and graded.

There will be two class quizzes-in mid-March and mid-April, and a term research paper with an oral presentation in lieu of a final exam. Term paper topics must be chosen by April 1 and approved by the instructor. They should be based on material in the textbook, but go beyond what is covered in class.