

Level Seven

Atomic Physics

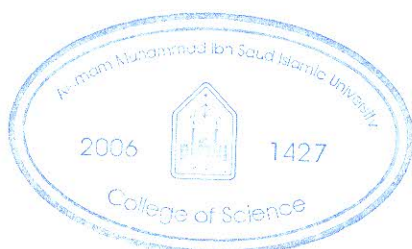
Course Code	Course Num.	Course Name	Credit Hours	Lec	Lab	Tut	Prerequisites
PHY	462	Atomic Physics	3	3	0	1	PHY312

Objectives:

- To enable students to understand essential atomic structures and processes occurring both in the laboratory as well as in the natural environment.
- To identify principles and laws when dealing with problems of atomic physics.

Syllabus:

<u>Week</u>	<u>Topics</u>	<u>Text Book Chapters</u>
1-3	Early Models of the atom: Thomson's model, Rutherford's model, difficulties with Rutherford model emission spectra, Absorption Spectra, Bohr's theory of the hydrogen, Bohr radius, radii and energy of orbital energy level diagram.	
4-6	Photo electricity: photoelectric emission, laws, Lenard's experiment, Richardson and Compton effect, Compton Scattering, experiment, Einstein's photoelectric equation, experimental verification of Einstein's photoelectric equation by Millikan's experiment, photoelectric cells.	
7-9	Vector Atom Model: Various quantum numbers, angular momentum, spin magnetic quantum number, electron clouds, shells and sub-shell, L.S and J.J couplings, De Broglie wave, Pauli's exclusion principle, electronic configuration of elements and periodic classification, magnetic dipole moment of electron due to orbital and spin motion, Bohr magneton, spatial quantization,	
10-11	Fine Structure of Spectral Lines: spectral terms and notations, selection rules, intensity rule and interval rule, fine structure of sodium D lines,.	
12-14	alkali spectra: fine structure of alkali spectra, spectrum of Helium, Zeeman effect, Larmor's theorem, Debye's explanation of normal Zeeman effect, Anomalous Zeeman effect (theoretical explanation	
15-17	Characteristic of X-rays: X-ray production, X-ray tube, Moseley plot, atomic transitions, energy levels, stimulated Absorption, spontaneous emission, stimulated emission, population Inversion. Lasers, production of a laser beam, He Ne example.	



References:

- Foot C: Atomic Physics (Oxford, 2004)
- Haken H and Wolf HC: Physics of Atoms and Quanta (Springer 6th ed., 2000)
- Woodgate GK: Elementary Atomic Structure (Oxford, 1980)
- Bransden BH and Joachain CJ: Physics of Atoms and Molecules (Longmans, 1983)

