

MGC-313 Natural Sciences (Modern Physics)

Prerequisite(s): Physics at Intermediate level

Credit Hours: 3(2 + 1)

Course Outline:

Origin of quantum theory: Black body radiation, Stefan Boltzmann, Wien's and Planck's law, consequences. The quantization of energy, Photoelectric and Compton effect, Line spectra, Explanation using quantum theory, Wave Nature of Matter: Wave behavior of particle (wave function etc) its definition and relation to probability of particle, De-broglie hypothesis and its testing, Davisson-Germer Experiment and J.P. Thomson experiment, Wave Packets and particles, localizing a wave in space and time, wave function, Normalization, expectation value, Atomic Physics: Bohr's theory (review), Frank-Hertz experiment, energy levels of electron, Atomic spectrum, Angular momentum of electrons, vector atom model, Orbital angular momentum. Spin quantization, Bohr's Magneton. X-ray spectrum (Continuous and Discrete) Moseley's law, Pauli's exclusion principle and its use in developing the periodic table, Nuclear Physics: Basic properties of a nucleus, Mass and Atomic Numbers, Isotopes, mass and size of a nucleus, Nuclear force (Basic Idea), Nuclear Radii, Nuclear masses, Binding energy, mass defect, Nuclear Spin and Magnetism, Natural Radioactivity: Laws of radioactive decay, half-life, mean life, chain disintegration; Alpha- Beta and Gamma decays (Basics idea), Measuring ionizing radiation (units i.e. Curie, Rad etc.), Nuclear Reactions: Basic Nuclear reaction, Q-value, Exothermic, Endothermic Nuclear model, Nuclear Fusion, Thermonuclear Fusion.

Recommended Books:

- *Halliday, D. Resnick, Krane, Physics, Vol. I & II, John Wiley, 5th edition, 1999*
- *Halliday, D. Resnick & Walker, Fundamental of Physics, Extended ed. John Wiley 5th Ed*
- *A. Beiser, Concepts of Modern Physics, 4th edition McGraw-Hill book Company, 1987*