Subject: MODERN ENGINEERING PHYSICS (Theory) **Code: PHY-481**

Elective For
B.Tech. VII

SYLLABUS

Wave Mechanics
Matter wave: Discovery, properties, De-Broglie's wavelength, Davission and Grammer's experiment. Application in calculation of wave velocity and group velocity. Heisenberg's Uncertainty Principle, Schrödinger's Wave Equation, Application in calculation of energy of a linear harmonic oscillator, Hydrogen atom.

Atomic and Molecular Spectra
Effect of magnetic field on an atom, application in Zeeman effect, Beschan Back effect, Stark effect. Modular spectra, Rotation spectra, Vibration-rotation spectra, electronics spectra. The study of Raman Effect and laser. Luminescence kinds and its application in solid state. T.V screen and display devices

Electrical Properties of Material:
Band theory of Solids: valance band , Conduction band and forbidden band , electron and holes , energy levels , difference between insulators , conductors and semiconductors, properties and kind of semiconductors , behavior of an electron in periodic potential (Kroning penny model). Photoconductor, solar cell photovoltaic cells, Hall effect and Hall coefficient. Superconductivity: Superconducting materials, critical field, magnetic properties of superconductors, FET and MOSFET.

Reference:

1. Atomic Physics by J.B. Rajam
2. Quantum Physics by Satya Prakash
3. Quantum Physics by H C Verma
4. Solid State Physics by C. Kittel
5. Solid State Physics by S.O.Pillai
6. Solid State Physics by M. A. Wahab

Subject : NUCLEAR POWER ENGINEERING (Theory) **Code: PHY-482**

Elective For
B.Tech. VII

SYLLABUS

Neutron Physics:
The production of Neutrons, Detection, interaction of neutrons with matter in bulk, Thermal neutrons, Diffusion of Thermal Neutrons, Cross-section, absorption for Neutron Induced reactions, Measurement of total cross-section. Scattering, absorption and activation cross sections.

Nuclear Fission:
Fission Cross-sections & Thresholds, The fission products, Mass & Energy distributions of the fission products, Neutrons emission in fission. Energy distribution of the neutrons emitted in fission, energy released in fission, theory of fission process.

Particle Accelerator and Detectors:
Acceleration of Charged Particles, Particles Accelerators: Electronic accelerator Orbital Accelerators, G.M counter, scintillation counter, solid state detectors, cloud chamber, bubbles chamber, ionization chamber and proportional counter, Electrostatic generator, Linear accelerators, Alternating gradient synchrotron.

Nuclear Energy:
Equivalence of mass and energy, mass defect, plucking fraction, binding energy, nuclear fission and fusion Q values of a nuclear reaction.
Nuclear energy sources, Nuclear fission as a source of energy, chain reacting system, Thermal Nuclear reactors, Calculation of the multiplication factor for a- homogeneous thermal reactor, Heterogeneous thermal reactor, Critical size, Power & Breeding, Energy production in stars.

References:

1. Nuclear Physics by Irvin Kaplan
2. Nuclear Physics by D.C. Tayal
3. Particle Detectors by Glenn Knoll

Subject: **Fundamental of Nanotechnology and Nanoscience** (Theory) **Code: PHY-483**

Elective For
B.Tech. VII

SYLLABUS

Introduction to Nanotechnology and Nanoscience- Historical background and evidences from nature, The length scale; Characteristic scale for quantum phenomena-Quantum Confinement; Nanostructures-Quantum well, quantum dots, quantum wires. Nano-clusters; 0D, ID, 2D and 3D Nanomaterials; Bonding and Band gap tuning; Discovery of C60.Fullerene; Carbon Nano Tubes (CNTs)-types, structures, synthesis of CNTs; Transport, Optical, Thermal and Mechanical Properties of Nanostructures: Synthesis techniques of nanomaterials/ nano-composite - Top down and bottom up; Chemical and physical methods of preparation of nanomaterials- Wet-chemical, Sol-gel, hydrothermal, Solid state reaction and thermal and e-beam routes for preparation of nanostructures; Characterization Techniques: XRD, SEM, TEM, AFM, UV-Vis & FTIR Spectroscopy, AFM; Applications of nanomaterials- Energy harvesting, Environmental control, Conducting polymers, Display devices, NEMS and MEMS

Reference:

1. Atomic Physics by J.B. Rajam
2. Quantum Physics by Satya Prakash
3. Quantum Physics by H C Verma
4. Solid State Physics by C. Kittel
5. Solid State Physics by S.O.Pillai
6. Solid State Physics by M. A. Wahab