

K S K V Kachchh University
B. Sc. (Physics) CBCS Syllabus
(In force from June 2016)

Semester - IV

US CEPH – 405

(Classical Mechanics, Quantum Mechanics, Solid State Physics, Optics)

Unit-I

Classical Mechanics

Mechanics of System of particles; Motion of a system with variable mass;

Moving Coordinate system: Coordinate system with relative translational motions; Rotating coordinate systems; The coriolis force; Motion on the earth; Effect of coriolis force on a freely falling particle.

Ref. : Introduction to Classical Mechanics by R.G. Takwale & P.S. Puranik
(Chapter 3, Art. 3.5 & 3.6; Chapter 9, Art. 9.1 to 9.5)

Unit-II

Quantum Mechanics

Difficulties with classical models; Optical Spectra; Blackbody radiation; The Franck-Hertz experiment.

Photons as particles: The Compton effect; Particle diffraction.

Ref.: Quantum Mechanics by John. L. Powell, Bernd Crasemann
(Chapter 1, Art. 1.1 to 1.3, 1.5; Chapter 2, Art. 2.1, 2.2)

Quantum Mechanics; The wave equation; Schrodinger's Equation: Time Dependent form; Expectation Values; Schrodinger's Equation: Steady state form; Particle in Box.

Ref.: Concepts of Modern Physics by Arthur Beiser.
(Chapter 5, Art. 5.1 to 5.6)

Unit-III

Solid State Physics

Crystallography: Introduction; Single and Polycrystalline crystals; Symmetry considerations; Periodicity in crystals; Unit cell; Number of atoms or lattice points per unit cell; Representation of planes: Miller indices; Spacing of planes in crystal lattice; Density of lattice points; Symmetry elements; Symmetry groups; Point groups; Space group; Characteristics of space group; Determination of space group; Classification of crystals; Bravais lattice in two dimensions; Bravais lattice in three dimensions; Different crystal structures; Hexagonal close-packed structure; Face-centered cubic or cubic close-packed structure; Body-centered cubic structure; Simple cubic structure; Diamond structure; Zinc blende structure; Sodium chloride structure; Cesium chloride structure.

Diffraction of X-rays: Determination of Crystal Structure; Bragg's law; Bragg's law in one dimension; Bragg's law in three dimension; Characteristics features of Bragg's law.

Ref.: Fundamentals of Solid state physics by Saxena Gupta Saxena
(Chapter 1, Art. 1.1 to 1.18; Chapter 2, Art. 2.1, 2.2)
Rudiments of Material Science by S.O. Pillai & Sivakami Pillai

Unit-IV

Optics

Resolving Power: Resolving Power; Rayleigh's Criterion; Limit of Resolution of the Eye; Limit of resolution of a Convex lens; Resolving power of optical instruments; Criterion for Resolution according to lord Rayleigh; Resolving power of a Telescope; Resolving power of a microscope; Ways of increasing resolution; Magnification versus Resolution.

Fiber optics : Introduction; Optical fiber; Necessity of Cladding; Optical fiber System; Optical Fiber Cable; Total internal reflection; Propagation of light through and optical fiber; Critical Angle of Propagation; Acceptance Angle; Fractional refractive index; Numerical aperture; Fiber optic Communication system; Merits of Optical Fiber.

Ref.: A Textbook of OPTICS by Subrahmanyam, Brijlal, Avadhanulu
S. Chand & Company Ltd., New Delhi. Twenty fourth Revised Edition 2010
(Chapter 19, Art. 19.1 to 19.10; Chapter 24, Art. 24.1 to 24.6, 24.21, 24.22)

US CEPH – 405 PRACTICALS

- (1) Wavelength of prominent Lines of Hg spectrum by Grating
- (2) Wavelength of light by Edser's diffraction pattern
- (3) Double refraction in calcite prism.
- (4) Characteristics of UJT
- (5) Figure of merit of Ballistic Galvanometer.
- (6) e/m by Thomson's Method
- (7) Resonance pendulum
- (8) Numerical Interpolation

US CEPH – 406 (Atomic Spectra, Nuclear Physics, Relativity, Plasma)

Unit –I

Atomic Spectra

Orbital Magnetic Dipole moment: Bohr Magnetron; Larmor Precession; space quantization; Electron Spin; Vector model of the atom; Spectroscopic terms and their notations; The Stern-Gerlach experiment;

Normal and Anomalous Zeeman effect; Explanation of Normal Zeeman effect; Explanation of Anomalous Zeeman effect.

Ref. : Atomic and Molecular Spectra By Rajkumar (Kedar Nath Ramnath Publication)
(Chapter 4, Art. 1 to 7; Chapter 12, Art. 1 to 3)

Unit-II

Nuclear Physics

Physical Tools: Interaction between particles and matter: A brief survey ; Detectors for Nuclear Particles: (i) Proportional Counter (ii) The Geiger Counter (iii) Scintillation Counter (iv) Solid state or Semi conductor Detector (vi) Cloud and Bubble Chambers; Particle Accelerators: (i) Van de Graaff Generator (ii) The cyclotron.

The Q Equation: Introduction; Types of Nuclear Reactions; The balance of Mass and Energy in Nuclear Reaction; The Q Equation; Solution of Q Equation.

Ref. : Nuclear Physics by S.B Patel
(Chapter 1, Art.1.I.2 to 1.I.4; Chapter 3, Art. 3.1 to 3.5)

Unit-III

Relativity

Lorentz Transformation equations; Concept of Ether; Michelson Morley Experiment; Lorentz Transformation equations.

Postulates of Special Relativity; Time Dilation; Doppler Effect; Length Contraction; Twin Paradox; Relativity of Mass; Mass and energy; Mass less particles.

Ref.: Concepts of Modern Physics by Arthur Beiser.
(Chapter 1, Art. 1.1 to 1.5, 1.7 to 1.9)

Unit-IV

Plasma

Introduction; composition and characteristics of a plasma; Collisions; Surface phenomena; Transport phenomena; Diffusion and Mobility: Ambipolar diffusion; Viscosity: Conductivity; Recombination; Ohm's law; Gas Discharge; Comparison of Various natural and Man-made plasmas; Plasma diagnostics; Plasma waves and instabilities; Space plasma.

Ref. : Elements of Plasma Physics By S. N. Goswami
(Chapter 1, Art. 1.1 to 1.14)

US CEPH – 406 PRACTICALS

- (1) Y- By Koenig's Method
- (2) Study of Electron Diffraction pattern
- (3) C_1/C_2 by Desauty's Method
- (4) h- Parameters
- (5) Transistor Amplifier
- (6) Measurements by C.R.O
- (7) Nand Gate as universal gate
- (8) Numerical solution of secular Determinant