Krantiguru Shyamji Krishna Verma

Kachchh University

Mundra Road

BHUJ :370 001

SYLLABUS (CBCS)

B. Sc. Semester III & IV

PHYSICS

Code : PHY - 301/302 , 401/402

With effect from June 2012

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K S K V Kachchh University

S. Y. B. Sc. (Physics) CBCS Syllabus

(In force from June 2012)

Semester - III

PHYSICS – 301

Unit-I Thermodynamics

Thermodynamic Variables (6.1),Extensive and intensive Variables (6.2), Maxwell's Thermo dynamical Relations (General Relationship) (6.3), Applications of Maxwell's Thermodynamic Relations(6.4) Specific Heat Equation(6.4.1) Joule-Thomson Cooling(6.4.2) Joule-Thomson Coefficient(μ) (6.4.3)Temperature of Inversion(6.4.4)Heating effect of Hydrogen and Helium at Room Temperature(6.4.5)Temperature change in Adiabatic Process(6.4.6)Clausius-Clapeyron's Equation (First Latent Heat Equation)(6.4.7), Thermodynamic Potentials(6.5), Significance of Thermodynamic Potentials(6.6), Relation of Thermodynamical Potentials with their Variables(6.7), Relation between Cp, Cv and μ(6.8), The T.dS Equations(6.9), Clapeyron's Latent Heat Equation using Maxwell's Thermodynamical Relations(6.10), Clapeyron Latent Heat Equation using Carnot's Cycle(6.11) Adiabatic Stretching of a wire(6.12), Internal Energy of Ideal and Real Gases(6.13), ClausiusInequality(6.14),Entropy and the Second law of Thermodynamics(6.15), Joule-Kelvin Coefficient(6.16)

Ref : Heat and Themodynamics and Statistical Physics, By Brijlal, Dr. N. Subrahmanyam, P.S.Hemme, S.Chand & Company Ltd., New Delhi. Reprint 2012

Unit-II Statistical Mechanics

Statistical Basis(9.1), Probability(9.2), Principle of Equal A Priori Probability(9.3), Probability and Frequency(9.4), Some Basic Rules of Probability Theory(9.5), Permutations and Combinations(9.6), Macrostate and Microstate(9.7), Thermodynamic Probability(9.8), Degrees of Freedom(10.1). Position Space(10.2), Momentum Space(10.3), Phase Space(10.4), The muspace and Gamma Space(10.5), Division of Phase Space into Cells(10.6), Applications(10.7), Fundamental Postulates of Statistical Mechanics(10.8), Density of Quantum States of Energy of a Particles(10.9), Statistical Ensembles(10.10), Microcanonical Ensemble(10.10.1)Canonical Ensemble(10.10.2)Grand- Canonical Ensemble(10.10.3), Comparison of Ensembles(10.11), Bridge with Macroscopic Physics(10.13), Theories Based on Statistical Mechanics(10.14), Entropy and Probability(10.15), Boltzmann's Canonical Distribution Law(10.16), Application

of Boltzmann's Canonical Distribution Law(10.17), The Equipartition of energy(10.18), Introduction, Three kinds of Particles(11.1), M.B. Statistics Applicable to Ideal Gas(11.2), Maxwell-Boltzmann Energy Distribution law(11.3), Application of M.B.Distribution law(11.4), Mean, RMS and Probable Speeds(11.5), Maxwell's Distribution Law of Velocities(11.6), Doppler Broadening of Spectral Lines(11.7), Limitations of Maxwell-Boltzmann's Method(11.8), Experimental Verification of Maxwellian distribution of Molecular Speeds(11.9), Some Useful Standard Definite Integrals(11.10)

Ref : Heat and Themodynamics and Statistical Physics, By Brijlal, Dr. N. Subrahmanyam, P.S.Hemme, S.Chand & Company Ltd., New Delhi. Reprint 2012

Unit-III Optics

Introduction(17.1), Huygens-Fresnel Theory(17.2), Fresnel's Assumptions(17.3), Rectilinear Propagation of Light(17.4.4), Zone Plate(17.5) Action of a zone plate for an incident spherical wave front(17.5.1) Difference between a zone plate and a convex lens(17.5.2), Distinction between Interference and Diffraction(17.6), Fresnel and Fraunhoffer Types of diffraction(17.7), Diffraction at a Circulat Aperture(17.8) Mathematical Treatment of Diffraction at a circular Aperture(17.8.1)Intensity at a Point away from the centre(17.8.2) Introduction(18.1), Fraunloffer Diffraction at a Single Slit(18.2), Intensity Distribution in diffraction pattern due to a single Slit(18.2.1), Fraunhoffer Diffraction at a Single slit (Calculus Method)(18.2.2), Fraunhoffer Diffraction at Double Slit(18.4) Fraunhoffer Diffraction at Double Slit (Calculus Method)(18.4.1) Distinction Between Single slit and Double Slit Diffraction Patterns(18.4.2), Interference and Diffraction(18.5), Fraunhoffer Diffraction at N Slits(18.6)Intensity of Principal Maxima(18.6.1).

Ref :A Textbook of OPTICS ,Dr. N. Subrahmanyam, Brijlal, Dr. M.N.Avadhanulu S.Chand & Company Ltd., New Delhi. Twenty fourth Revised Edition 2010

Unit IV Atmospheric Physics

Composition of Planetary atmospheres (3.3),Evolution of atmospheres(3.4), Earth's neutral atmosphere (3.6), Composition of air at the surface (3.6.1),Atmospheric divisions (3.6.2), other divisions(3.6.3), Pressure and density variations(3.7), Static Atmosphere (3.7.1), Dynamic atmosphere (3.7.2), Density and Temperature distribution models(3.7.3), Energetic of the lower atmosphere(3.8), Thermodynamics of dry air(3.8.1), Entropy and potential temperature(3.8.2), Heat budget of the atmosphere(3.8.3), Atmospheric circulation (3.9), General principles (3.9,1),Coriolis force and angular momentum (3.9.2), Classes of Winds(3.9.3), Basics equations for large scale flow(3.9.4), General atmospheric circulation (3.9.5), Wind pattern

with altitude(3.9.6), Thermospheric winds (3.9.7), Acoustic and internal gravity waves (3.9.8)

Ref : An introductory course on Space Science and Earth’s atmosphere, By shrinivas S. Degaonkar.

PHYSICS – 302

Unit 1 Electricity

Electrostatic Energy(1.14), Electric Dipol(1.15), Dipole in Uniform Electric Field(1.16), Electric dipole in Non-Uniform Electric Field(1.17), Mutual Potential energy of Two Dipoles(1.18), Electric Double layers (1.19), Electric Quadrupole(1.20), Potential due to an Arbitrary Distribution of Charge(1.21),

Conductors and insulaters(2.1). conductor in an electrostatic field(2.2). electric field at the surface of a charged conductor(2.3). capacitor (2.4). the energy of capacitor (2.5). electronic response of non-conducting medium to an electric field(2.6), polarization(2.7)

Ref : Electro Magnetics by B.B. Laud

Unit 2 Magnetism

Electric Current(4.1), Ohm's law-Electrical conductivity(4.2), Thre calculation of Resistance (4.3),
Magnetic effect(4.4),The Magnetic field(4.5), Force on a Current (4.6), Bio-Savart law(4.7), The laws of Manetostatics(4.8), The Magnetic Potential(4.9), Magnetic media(4.14), Magnetization(4.15), Magnetic field vector (4.16), Magnetic Susceptibility and Permiability(4.17)

Ref : Electro Magnetics by B.B. Laud

Unit 3 Electronics

Bipolar Transistors : Introduction (3.1), Construction of Junction Transistor(3.2), Operation of a PNP Transistor (3.3), Operation of NPN Transistor(3.4) Supply voltage connection (3.5), Current Amplification Factors (3.6), Transistor leakage Currents(3.7), Characteristic Curve of a Transistor in Common-Emitter Connection and Definitions of h-Parameters(3.8), Characteristic Curve of a Transistor in Common-Base Connection and Definitions of h-Parameters(3.9), Transistor current and Voltage Notations(3.10), Transistor as an Amplifier(3.11), Basic Transistor Amplifier Circuits(3.12), D.C. Load Line(3.13), Grafical Analysis of Common-Emitter Voltage Amplifier(3.14),A.C. Load Line (3.15)

Ref: Elements of Electronics by Bagde and Singh

Unit 4 Electronics

FET, MosFET, UJT, LED,SCR, Tunnel Diode, Solar cell,

Introduction (4.1), Factors which cause shift of the Operating point(4.2), Stability factor(4.3), Fixed Bios circuit(4.4), Collector to Base Bios (4.5),Emitter Bias (4.6), Bias Compensation (4.7) Thermal Runaway(4.8), Thermal Resistance(4.9), Condition for thermal Stability(4.10)

Ref: Elements of Electronics by Bagde and Singh

Ref : Principles of Electronics by V.K. Mehta and Rohit Mehta (S.Chand ,company Ltd. New Delhi)

PHYSICS – 401

Unit-1 Classical Mechanics.

Mechanics of System of particles (3.5) , Motion of a system with variable mass (3.6)

Moving Coordinate system

Coordinate system with relative translational motions(9.1), Rotating coordinate systems(9.2) The coriolis force(9.3), Motion on the earth(9.4), Effect of coriolis force on a freely falling particle (9.5),

Ref : Classical Mechanics : R.G. Takwale and P.S.Puranik

Unit II Quantum Mechanics

Difficulties with classical models (1.1) ,Optical Spectra (1.2), Blackbody radiation (1.3), The Franck-Hertz experiment (1.5), Photons as particles : The Compton effect (2.1), Particle diffraction (2.2),

Ref: Quantum Mechanics : John. L. Powell, Bernd Crasemann

Quantum Mechanics (5.1), The wave equation (5.2), Schondinger's Equation : Time Dependent form(5.3), Expectation Values (5.4), Schondinger's Equation : Steady state form (5.5), Particle in Box (5.6)

Ref : Concepts of Modern Physics: Arthur Beiser.

Unit III Solid State Physics

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 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. Liquid crystals, Problems.

Diffraction of X-rays**:** Determination of Crystal Structure , Experimental methods in X-rays Differations, Laue Method, Rotating Crystal Method, Powder-photograph Method

Ref : Fundamentals of Solid state physics by Saxena Gupta Saxena, J.P Shrivastava

Unit IV : Optics

Resolving Power (19.1), Rayleigh's Criterion (19.2), Limit of Resolution of the Eye (19.3), Limit of resolution of a Convex lens(19.4), Resolving power of optical instruments(19.5), Criterion for Resolution according to lord Rayleigh(19.6) , Resolving power of a Telescope(19.7), Resolving power of a microscope(19.8), Ways of increasing resolution (19.9), Magnification versus Resolution (19.10),

Fiber optics : Introduction (24.1),Optocal fiber(24.2), Total internal reflection (24.3), Propagation of light through and optical fiber (24.4), Fractional refractive index (24.5) Numerical aperture(24.6), Fiber optic Communication system(24.21), Merits of Optical Fiber(24.22)

Ref : A Textbook of OPTICS ,Dr. N. Subrahmanyam, Brijlal, Dr. M.N.Avadhanulu S.Chand & Company Ltd., New Delhi. Twenty fourth Revised Edition 2010

PHYSICS – 402

Unit -I Atomic Spectra

Orbital Magnetic Dipole moment: Bohar Magnetron, Larmor Precession, space quantization. Electron Spin . Vector model of the atom. Spectroscopic terms and their notations, The Stern-Gerlach experiment. Normal Zeeman effect. Anomalous Zeeman effect . Paschen-back effect, The lande “g” factor. Stark Effect,

Ref : Atomic and Molecular Spectra By Rajkumar, (Kedar Nath Ramnath Publication)

Ref : Spectroscopy By B.P. Straughan and S. Walker

Unit-II Nuclear Physics

Interaction between particles and matter: A brief survey (1.1.2), 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 (1.1.4)Van de Graaff Generator (i), The cyclotron (ii),

Q Equation : Introduction (3.1), Types of Nuclear Reactions (3.2) ,The balance of Mass and Energy in Nuclear Reaction(3.3), The Q Equation (3.4), Solution of Q Equation (3.5)

Ref: Nuclear Physics by S.B Patel

Unit-III Relativity

Gallalion Transformation equations, Concept of Ether, Michalson Morley Experiment, Lorentz Transformation equations, Special Theory of Relativity (1.1), Time Dilation (1.2), Doppler Effect (1.3), Length Contraction (1.4) Twin Paradox (1.5), Relativity of Mass(1.7), Mass and energy (1.8), Mass less particles (1.9), General Relativity (1.10)

Ref: Concepts of Modern Physics by Beiser

Unit – IV Plasma

Introduction (1.1), composition and characteristics of a plasma(1.2), Collisions(1.3), Surface phenomena(1.4), Transport phenomena(1.5),Diffusion and Mobility: Ambipolar diffusion (1.6), Viscosity: Conductivity(1.7), Recombination (1.8), Ohm’s law (1.9), Gas Discharg(1.10), Comparison of Various natural, and Man-made plasmas(1.11), Plasma diagnostics(1.12),Plasma waves and instabilities (1.13),Space plasma(1.14)

Ref : Elements of Plasma Physics By S N Goswami

Practical

Semester III

Paper 301

(1) Flatness of plate by Newton's rings

(2) Thickness of a glass plate and radius of curvature of convex lens by optical lever

(3) Resolving power of Telescope

(4) 'L' by Maxwell's Bridge

(5) Study of Transformer

(6) Caushy's Constants

(7) Experimental check ups by multimeter

(Power supply, resistor, Transistor, Diode, Capacitor)

(8) Absorption co-efficient of Liquid by photocell.

Semester – III

Paper-302

(1) Y- By Koening's Method

(2) 'g' By bar pendulum

(3) Logic Gates

(4) High R by Leakage

(5) Characteristics of FET

(6) Hartman Formula

(7) Permeability of Free space

(8) Numerical Differentiation

Practical

Semester – IV

Paper-401

(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 Bllastic Galvanometer.

(6) e/m by Thomson's Method

(7) Resonance pendulum

(8) Numerical Interpolation

Semestrer –IV

Paper-402

(1) Goniometer

(2) Study of Electron Diffraction pattern

(3) C_1/C_2 by Desauty's Method

(4) h- Parameters

(5) Measurements by C.R.O

(6) Numerical solution of secular Determinant

(7) Nand Gate as universal gate.

(8) Study of Magnetic field of solenoid