Government Chandulal Chandrakar Art and Science College, Patan

DEPARTMENT OF PHYSICS

Teaching Plan

Academic Year: 2023-2024 CLASS: **B.Sc. First Year**

Name of teacher – **Dr. Ugendra Kumar Kurrey** **Paper- First**

Course type: **Theory** Course Title: **Mechanics, oscillations and Properties of matter**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
July	Unit – 1	**Vectors;** Vector algebra, Derivatives of a vector with respect to a parameter, Scalar and vector products of two, three and four vectors, Gradient , divr\ergence and curl of vectors fields, Polar and Axial vectors. **Ordinary Differential Equations:** Ist order homogeneous differential equations, exact and non- exact differential equations, 2nd order homogeneous and non-homogeneous differential equations with constant coefficient (Operator Method Only).	**10**	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
August & September	Unit – 2 & 3	**Laws of Motion:** Review of Newton's Laws of motion. Dynamics of a system of particles, Concept of Centre of Mass, determination of center of mass for discrete and continuous systems having cylindrical and spherical symmetry. **Work and Energy:** Motion of rocket, Work- Energy theorem for conservative forces, Force as a gradient of Potential Energy , Conservation of momentum and energy, Elastic and in-elastic Collision. **Rotational Dynamics**: Angular velocity, Angular momentum, Torque, Conservation of angular momentum, Moment of Inertia, Theorem of parallel and perpendicular axes (Statements only), Calculation of moment of inertia of discrete and continuous objects (rod, disc, cylinder, solid sphere). **Elasticity:** Hooke's Law- Stress- strain diagram—Elastic moduli, Relation between elastic constants- Poisson's Ratio- Expression for Poisson's Ratio in terms of Elastic Constant, Work done in stretching and work done in twisting a wire- Twisting couple on a cylinder- Determination of Rigidity modules, Elementary idea of Surface tension and Viscosity, Flow of fluids, coefficient of Viscosity, Stoke's law, expression for terminal velocity, wetting.	20	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
October	Unit – 4 & 5	**Gravitation:** Newton's Law of Gravitation, Motion of a particle in a central force field(motion is in a plane, angular momentum is conserved, areal velocity is constant), Kepler's Laws(statements only), Satellite in circular orbit and applications, Geosynchronous orbits. **Oscillations:** Simple harmonic motion, Differential equation of SHM and its solutions, Kinetic and Potential energy, Total energy and their time averages, Compound pendulum, Differential equations of damped oscillations and forced oscillations(Conceptual only). **Special Theory of Relativity:** Frame of reference, Galilean Transformations, Inertial and Non –inertial frames, Outcomes of Michelson Morley's Experiment, Postulates of Special Theory Of Relativity, Length contraction, Time dilation, Relativistic transformation of velocity, Relativistic variation of mass, ass-energy equivalence, Transformation of Energy and Momentum.	20	➢ Chalk and talk method ➢ Problem Solving ➢ Test ➢ Notes

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Government Chandulal Chandrakar Art and Science College, Patan

DEPARTMENT OF PHYSICS

Teaching Plan

Academic Year: 2023-2024

CLASS: **B.Sc. First Year**

Name of teacher – **Dr. Ugendra Kumar Kurrey** **Paper: Second**

Course type: **Theory** **Course Title**: ELECTRICITY,MAGNETISM AND ELECTROMAGNETIC THEORY

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
November and December	Unit – 1 & 2	Vector integration, Line ,surface and volume integrals of a vector field. Gauss`s divergence theorem, and Stoke`s theorem of vectors and its application in electrostatics and magneto statics.. Electrostatics-I: Electroststics field, electric flux, Gauss's theorem of electrostatics, Applications of Gauss theorem-Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor.	Quarterly Exams Unit-1: Total Lecture 10 Unit-2: Total Lecture 5	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
December and January	Unit – 2, 3 & 4	Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere, calculation of electric field from potential, capacitance of an isolated spherical conductor, parallel plate , spherical and cylindrical condenser, energy per unit volume in electroststics field. Dielectric and Electric Currents: Dielectric medium: polarization, displacement vetor constant, Gauss`s Law in dielectrics, polar and Non polar dielectrics, parallel plate capacitor completely filled with dielectric. Steady current, current density J, non-steady currents and continuity equation,Kirchoff's law, Ideal constant- voltage and constant current sources, Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and maximum power transfer theorem, rise and decay of current in LR,CR and LCR circuits. Magnetism: Magnetostatics: Biot-Savart's law and its applications, straight conductor, circular coil, solenoid carrying current, divergence and curl of magnetic field, Magnetic vector potential, Ampere's circuital law.	Unit-2: Total Lecture 5 Unit-3: Total Lecture 10 Unit-4: Total Lecture 8	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
February	Unit –4 & 5	Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability,magnetic susceptibility, brief introduction of dia, para and ferro magnetic materials. Electromagnetic Induction: Faraday's laws of Electromagnetic Induction, Lenz's law, self and mutual induction, L of single coil, M of two coils, Energy stored in magnetic field. Maxwell's equations and Electromagnetic wave propagation: Equations of continuity of current, Displacement current, Maxwell's equations, wave equation in free space.	Unit-4: Total Lecture 5 Unit-5: Total Lecture 10	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes

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Government Chandulal Chandrakar Art and Science College, Patan

DEPARTMENT OF PHYSICS

Teaching Plan
Academic Year: 2023-2024
CLASS: B.Sc. Second Year

Name of teacher – **Mr. Manoj Sahu** **Paper- First**
Course type: **Theory** Course Title: **Thermodynamics, Kinetic Theory and Statistical Physics**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
July and August	Unit – 1	The laws of thermodynamics: the Zeroth law, first law of thermodynamics internal energy as a state function, reversible and Irreversible change, Carnot's cycle, Carnot theorem, second law of thermodynamics, Claussius theorem inequality, Entropy, change of Entropy in simple cases, (i) isothermal expansion of an ideal gas (ii)Reversible Isochloric process, (iii) free adiabatic expansion of an ideal gas, Concept of Entropy. Entropy of the universe, entropy change in reversible and Irreversible process, entropy of ideal gas, entropy as a thermodynamic variable. S-T diagram, principle of increase of Entropy. The thermodynamic scale of temperature, Third law of thermodynamics, concept of negative temperature.	**10**	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
September and October	Unit – 2 & 3	Thermodynamics function, internal energy, Enthalpy, Helmholtz function and GIBB'S free energy. Maxwell thermo-dynamical equations and their application. TdS equation, energy and heat capacity equation, application of Maxwell equation in Joule-Thomson cooling, Adiabatic cooling of a system Van-der Waals gas, Black Body spectrum, Stefan Boltzmann law, Wien's displacement law, Rayleigh jean's law, Planck's Quantum Theory of Radiation. Maxwellian distribution of speeds in an ideal gas: distribution of speed and velocities, experimental verification, distinction between mean RMS and most probable speed values. Doppler broadening of spectral lines, Transport phenomena in gases: Molecular collisions mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure. Behavior of real gases: deviations from real gas equation. The virial equation, Andrew's experiments on carbon dioxide gas, critical constant.	20	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes

November	Unit – 4 & 5	The statistical basis of thermodynamics: Probability and thermodynamic probability, Principle of equal a Priori probabilities, statistical postulate. Concept of Gibb's ensembles, accessible and inaccessible state concept of phase space, gamma phase space, μ phase space. Equilibrium before 2 system in thermal contact, Probability and entropy, Boltzmann entropy relation, Boltzmann Canonical distribution law and its application. law of equipartition of energy. Transition to Quantum statistics: "h" as a natural constant and its implications, cases of particle in a one dimensional box and one dimensional harmonic oscillator. Indistinguishability of particles and its consequences, Bose Einstein and Fermi Dirac condition, concept of partition function, derivation of Maxwell Boltzmann, Bose Einstein and Fermi Dirac statistics limits of B-E and F-D statistics to M-B statistics, application of B-E statistics to black body radiation application of F-D statistics to free electrons in a metal.	20	➢ Chalk and talk method ➢ Problem Solving ➢ Test ➢ Notes

Remark:–

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Government Chandulal Chandrakar Art and Science College, Patan

DEPARTMENT OF PHYSICS

Teaching Plan

Academic Year: 2023-2024

CLASS: **B.Sc. Second Year**

Name of teacher – **Mr.Manoj Sahu** **Paper: Second**

Course type: **Theory** Course Title **WAVES, ACOUSTICS AND OPTICS**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
December	Unit – 1 & 2	Waves in media: speed of transverse waves on uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves. Waves over liquid surface: gravity waves and ripples. Group velocity and phase velocity and relationship between them. Production and detection ultrasonic and infrasonic waves and applications. Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection and refraction at a boundary, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging. Fermat's principle of extremum path, the aplanatic points of a sphere and other applications. Cardinal points of an optical system, thick lens and lens combinations. Lagrange equation of magnification, telescopic combination, telephoto lenses. Monochromatic aberrations and their reductions; aspherical mirrors and Schmidt collector plates, Aplanatic points, Oil immersion objectives, meniscus lens.	Quarterly Exams Unit-1: Total Lecture 10 Unit-2: Total Lecture 5	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
January	Unit – 2, 3 & 4	Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces.(Ramsdon and Hygen's eyepieces). Interference of light: The principle of superpositions, two slit interference, coherence requirement for the sources, optical path retardations, Conditions for sustained interference, Theory of interference, Thin films. Newton's rings and Michelson interferometer and their applications its application for precision determinations of wavelength, wavelength difference and the width of spectral lines. Multiple beam interference in parallel film and Fabry- Perot interferometer. Rayleigh refractometer. Twyman-Green interferometer and its uses. Diffraction, Types of Diffraction, Fresnel's diffraction, half-period zones, phasor diagram and integral calculus methods, the intensity distribution, Zone plates	Unit-2: Total Lecture 5 Unit-3: Total Lecture 10 Unit-4: Total Lecture 5	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
February	Unit –4 & 5	Diffraction due to straight edge, Fraunhofer diffraction due to a single slit and double slit, Diffraction at N- parallel slit, plane diffraction grating, Rayleigh criterion, resolving power of grating, Prism, telescope. Polarized light and its mathematical representation, Production of polarized light by reflection, refraction and scattering. Polarization by double refraction and Huygen's theory, Nicol prism, Retardation plates, Production and analysis of circularly and elliptically polarized light. Optical activity and Fresnel's theory, Biquartz polarimeter. Laser system: Basic properties of Lasers, coherence length and coherence time, spatial coherence of source, Einstein's A and B coefficients, Spontaneous and induced emissions, condition for laser action, population inversion.Types of laser: Ruby and He-Ne laser. Applications of laser: application in communication, holography and basics of nonlinear optics and generation of harmonic.	Unit-4: Total Lecture 5 Unit-5: Total Lecture 10	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes

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DEPARTMENT OF PHYSICS

Teaching Plan

Academic Year: 2022-2023

CLASS: **B.Sc. Third Year**

Name of teacher –**Dr. Ugendra Kumar Kurrey** **Paper- First**

Course type: **Theory** Course Title: **Mechanics, oscillations and Properties of matter**

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
July and August	Unit – 1	Cartesian, Cylindrical and Spherical coordinate systems, Inertial and noninertial frame of references, Uniformaly rotating frame, Coriolis force and its applications, Motion of a particle in a central force Kepler's law, Effect of Centrifugal and Coriolis forces due to earth's rotation. Centre of mass, motion of centre of mass for a system of particles subject to external forces, elastic and inelastic collisions in one and two dimensions, Scattering angle in the laboratory frame of reference, conservation of linear and angular momentum, conservation of energy.	**10**	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
September and October	Unit – 2 & 3	Rigid Bodies motion, Rotational motion, moment of Inertia and their products, principal moments and axes, introductory idea of Euler's equation, Potential well and periodic oscillation, case of harmonic small oscillations, Differential equation and its solution, kinetic and potential energy, examples of Simple Harmonic oscillation: spring and mass systems, Simple and Compound Pendulam, Torsional pendulum. Bifilar oscillation,Helmholtz resonater, LC circuit, vibration of a mangnet, oscillation of two masses connected by a spring. Superposition of two simple harmonic motions of the same frequency,Lissajous figures, damped harmonic oscillator, case of different frequencies. Power dissipation, quality factor, examples driven {forced} harmonic oscillator, transient and steady ststes, power absorption, resonance.	20	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
November	Unit – 4 & 5	E as an accelerating field, electron gun, case of discharge tube, linear accelerator, E as deflecting field- CRO sensitivity, Transverse B field, 180 deflection, mass spectrograph, curvatures of tracks for energy delermimaton, principle of a cyclotron. Mutually perpendicular E and B fields velocity selector, its resolution. Parallel E and B fields, positive ray parabolas, discovery of isotopes, elements of mass spectrography, principal of magnetic focusing lens. Elasticity strain and stress, elastic limit, Hooke`s law, modulus of rigidity, poisson`s ratio, Bulk modulus, relation connecting different elastic-constants, twisting couple of a cylinder { solid and hallow}, bending moment, cantilever, young modulus by bending of beam. Viscosity poiseulle`s equation of liquid flow through a narrow tube, equation of continuity. Euler`s equation, Bernoulli`s theorem, viscous fluids, streamline and turbulent flow. Poiseulle`s law, coefficient of viscosity, stoke`s law, surface tension and molecular interpretation of surface tention, surface energy,Angle of contact,wetting.	20	➢ Chalk and talk method ➢ Problem Solving ➢ Test ➢ Notes

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DEPARTMENT OF PHYSICS

Teaching Plan

Academic Year: 2022-2023

CLASS: **B.Sc. Third Year**

Name of teacher – **Dr. Ugendra Kumar Kurrey**

Course type: **Theory** Course Title: SOLID STATE PHY, SOLID STATE DEVICES AND ELECT.

Month	Title unit	Topic of lecture	No. of lectures	Methods of delivery
December	Unit – 1 & 2	Amorphous and crystalline solids, Elements of symmetry, seven crystal system, Cubic lattices, Crystal planes, Miller indices, Laue's equation for X-ray diffraction, Bragg's Law, Bonding in solids, classification. Cohesive energy of solid, Madelung constant, evaluation of Parameters, Specific heat of solids, classical theory (Dulong-Petit's law), Einstein and Debye theories, Vibrational modes of one dimensional monoatomic lattice, Dispersion relation, Brillouin Zone. Free electron model of a metal, Solution of one dimensional Schrödinger equation in a constant potential, Density of states, Fermi Energy, Energy bands in a solid (KronigPenny model without mathematical details)	Quarterly Exams Unit-1: Total Lecture 10 Unit-2: Total Lecture 5	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
January	Unit – 2, 3 & 4	Difference between Metals, Insulator and Semiconductors, Hall effect, Dia, Para and Ferromagnetism, Langevin's theory of dia and para-magnetism, Curie- Weiss's Law, Qualitative description of Ferromagnetism (Magnetic domains), B-H curve and Hysteresis loss. Intrinsic and extrinsic semiconductors, Concept of Fermi level, Generation and recombination of electron hole pairs in semiconductors, Mobility of electrons and holes, drift and diffusion currents, p-n junction diode, depletion width and potential barrier, junction capacitance, I-V characteristics, Tunnel diode, Zener diode, Light emitting diode, solar cell, Bipolar transistors, pnp and npn transistors, characteristics of transistors, different configurations, current amplification factor, FET and MOSFET Characteristics. Half and full wave rectifier, rectifier efficiency ripple factor, Bridge rectifier, Filters, Inductor filter	Unit-2: Total Lecture 5 Unit-3: Total Lecture 10 Unit-4: Total Lecture 5	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes
February	Unit –4 & 5	L and π section filters, Zener diode, regulated power supply using zener diode, Applications of transistors, Bipolar Transistor as amplifier, h-parameter, hparameter equivalent circuit, Transistor as power amplifier, Transistor as oscillator, principle of an oscillator and Bark Hausen's condition, requirements of an oscillator, Wein-Bridge oscillator and Hartley oscillator. Digital Circuits: Difference between Analog and Digital Circuits, Binary Numbers, Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates (Realization using Diodes and Transistor), NAND and NOR Gates as Universal Gates, XOR and XNOR Gate, De Morgan's Theorems, Boolean Laws, Simplification of Logic Circuit using Boolean Algebra, Digital to Analog Converter, Analog to Digital Converter	Unit-4: Total Lecture 5 Unit-5: Total Lecture 10	➢ Chalk and talk method ➢ online platform ➢ Problem Solving ➢ Test ➢ Notes

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