GOVT COLLEGE ISRANA

Name of Extension Lect. Dr Mukesh Chander

Unit And Month	Class- Physics 1st	Sub-Mechanics	Code-B23-PHY-101
	Topics		
I(July-Aug 2024)	**Fundamentals of Dynamics**: Rigid body, Moment of Inertia, Radius of Gyration, Theorems of perpendicular and parallel axis (with proof), Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder, Solid sphere, Hollow sphere, Rectangular plate, Square plate, Solid cone, Triangular plate, Torque, Rotational Kinetic Energy, Angular momentum, Law of conservation of angular momentum, Rolling motion, condition for pure rolling, acceleration of body rolling down an inclined plane, Fly wheel, Moment of Inertia of an irregular body.		
II Sept 2024	**Elasticity:** Deforming force, Elastic limit, stress, strain and their types, Hooke's law, Modulus of rigidity, Relation between shear angle and angle of twist, elastic energy stored/volume in an elastic body, Elongation produced in heavy rod due to its own weight and elastic potential energy stored in it, Tension in rotating rod, Poisson's ratio and its limiting value, Elastic Constants and their relations. Torque required for twisting cylinder, Hollow shaft is stiffer than solid one. Bending of beam, bending moment and its magnitude, Flexural rigidity, Geometrical moment of inertia for beam of rectangular cross-section and circular cross-section. Bending of cantilever (loaded by a weight W at its free end), weight of cantilever uniformly distributed over its entire length. Dispersion of a centrally loaded beam supported at its ends, determination of elastic constants for material of wire by Searle's method.		
III Oct 2024	**Special Theory of Relativity:** Michelson's Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities, variation of mass-energy equivalence, relativistic Doppler effect, relativistic kinematics, transformation of energy and momentum, transformation of force, Problems of relativistic dynamics.		
IV Nov 2024	**Gravitation and central force motion:** Law of gravitation, Potential and field due to spherical shell and solid sphere. Motion of a particle under central force field, Two body problem and its reduction to one body problem and its solution, compound pendulum or physical pendulum in form of elliptical lamina and expression of time period, determination of g by means of bar pendulum, Normal coordinates and normal modes, Normal modes of vibration for given spring mass system, possible angular frequencies of oscillation of two identical simple pendulums of length (l) and small bob of mass (m_0 joined together with spring of spring constant (k).		
	<u>Practicum</u> 1. Measurement of length (or diameter) using Vernier Caliper, screw gauge and		

	travelling microscope. 2. To study the random error in observations. 3. To determine the area of window using a sextant. 4. Moment of Inertia of a Fly Wheel 5. Moment of Inertia of irregular body using a Torsion Pendulum. 6. Young's Modulus by Bending of Beam. 7. Modulus of rigidity of material of wire by Maxwell's Needle. 8. Elastic constants by Searle's method. 9. To determine the value of 'g' by using Bar pendulum. 10. To find the Poisson ratio of rubber by Rubber tube method. 11. To compare Moment of Inertia of a solid Sphere, Hollow Sphere and solid Disc of same mass with the help of Torsion Pendulum. 12. To determine the bending moment of a cantilever beam with uniformly distributed load, uniformly varying load and point load. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**

GOVT COLLEGE ISRANA

Name of Extension Lect. Dr Mukesh Chander

Unit And Month	Class: BA Sem 1 (MDC)	Subject: Physics fundamental 1	Code: B23-PHY-104
	Topics		
I(July-Aug 2024)	Physics - Nature, scope and excitement, major discoveries in Physics, major contribution by Indian Physicists, Physics in relation to other sciences, impact of physics on society and on latest development in science and technology. Units and Dimensions – Physical quantities – fundamental (mass, length and time) and derived. Need of measurement, fundamental and derived units, measuring process.		
II Sept 2024	Scalar and Vector quantities with definition, representation and examples, unit vectors, position vector, co-initial vector, collinear vector and co-planar vector. Scalar and vector product (no derivation). Motion of objects in one, two and three dimensions with examples, concept of position, distance, displacement, speed, velocity, average and instantaneous speed, average and instantaneous velocity and acceleration, uniform and non-uniform motion.		
III Oct 2024	Causes of motion- concept of force, Newton's laws of motion, daily life applications of Newton's laws of motion, inertia, linear momentum and their significance. Force of friction with daily life examples, Impulse with examples. Circular and rotational motion with examples. Idea of angular displacement, angular velocity, angular acceleration, frequency, time-period, torque, angular momentum, moment of inertia and is physical significance.		
IV Nov 2024	Work, Power and Energy – Work - definition, symbol, formula, units and type of work (zero, positive, negative) with examples. Energy - definition, symbol, formula, units, examples, types of mechanical energy, kinetic energy - definition, symbol and formula, potential energy - definition, symbol and formula, daily life examples demonstrating importance of energy, potential energy of an object at a height. Power – definition, formula and units, daily life examples.		
	Practicum 1. To measure the diameter of a small spherical / cylindrical body. 2. To measure the length, width and height of the given rectangular block. 3. To measure the internal diameter and depth of a given beaker/calorimeter and hence find its volume. 4. Use of screw gauge:(i) to measure diameter of a given wire and (ii) to measure thickness of a given sheet 5. To determine radius of curvature of a given spherical surface by a spherometer. 6. To find the weight of a given body using parallelogram law of		

	vectors. 7. Verification of Archimedes principle. 8. Verification of Work-energy theorem. 9. Acceleration due to gravity (g) by bar pendulum. 10. To determine the moment of Inertia of a fly-wheel. 11. Study of law of conservation of linear momentum and Kinetic Energy. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**

GOVT COLLEGE ISRANA Name of Extension Lect. Dr Mukesh Chander			
Unit And Month	**Class: BA 3rd sem MDC**	**Subject: Elements of modern Physics**	**Code: B23-PHY-304**
	Topics		
I(July-Aug 2024)	Basics of semiconductors - atomic structure, energy levels and energy bands (basic idea), types of materials (conductors, semiconductors and insulators) their energy band diagrams and definition on the basis of energy gap, intrinsic semiconductors, extrinsic semiconductors -p-type and n-type semiconductors (basic idea), Basics of Semiconductor devices - P-N junction diode - depletion layer, forward biasing and reverse biasing, V-I characteristics of PN junction diodes; ideal diode, diode as a switch, Basic idea of a Photodiode, Solar cell and Light emitting diode (LED).		
II Sept 2024	Magnetic Materials - Introduction, classification – paramagnetic, diamagnetic and ferromagnetic materials and their applications; Piezoelectricity and applications of Piezoelectric materials; Ceramics and polymers and their applications; Superconductivity, superconductors and their applications; Nanomaterials and their applications.		
III Oct 2024	Atomic nucleus – Idea of composition and properties of nucleus (charge, mass, size and density), nucleons, atomic number, mass number, isotopes, isobars and isotones; nuclear binding energy, Radioactive decay - α, β, and γ-decay; Idea of half-life time and decay constant, carbon dating and its importance, radioisotopes and their applications. Idea of nuclear fission and nuclear fusion. Nuclear reactors, source of solar and stellar energy.		
IV Nov 2024	Laser – introduction, absorption, spontaneous emission, stimulated emission, properties of laser light. Principle of laser - Light amplification, population inversion and pumping. Principle and working of Ruby, He-Ne and semiconductor laser (basic idea). Applications of Lasers in healthcare and different fields of science and technology. Basics of Fiber Optics- introduction to optical fibers (definition, principle and parts) light propagation and the optical fibers, types of optical fiber (basic idea), applications of optical fibers in medical, telecommunication and sensors.		
	Practicum 1.V-I characteristics of p-n junction diode. 2. V-I characteristics of Zener diode. 3. Characteristics of Solar Cell		

	4. To verify the inverse square law of light using a photo-voltaic cell. 5. To determine value of Boltzmann constant using V-I characteristic of PN diode. 6. To study the effect of intensity of light (by varying distance of the on an LDR 7. To verify the characteristics of LASER 8. To measure the numerical aperture of an optical fibre using He-Ne laser source. 9. Study double slit interference by He-Ne laser 10. Determine the diameter of a wire using (He-Ne Laser) diffraction method **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**

GOVT COLLEGE ISRANA

Name of Extension Lect. Dr Mukesh Chander

Unit and Month	**Class: BSc. Physics 3rd sem**	**Subject: Thermodynamics & Statistical Physics**	**Code: B23-PHY-301**
	Topics		
I(July-Aug 2024)	**THERMODYNAMICS-I** Thermodynamic-systems, variables and equation of state, thermal equilibrium, Zeroth law of thermodynamics; Concept of heat, work and its sign (work done- by the system on the system) & its path dependence, First law of thermodynamics- its significance and limitations, internal energy as a state function, different types of process-isochoric process, isobaric process, adiabatic process, isothermal process, cyclic process, Reversible and irreversible process, First law and cyclic process; Second law of thermodynamics and its significance, Carnot theorem; Absolute scale of temperature, Absolute Zero and magnitude of each division on work scale and perfect gas scale, Joule's free expansion, Joule Thomson effect, Joule-Thomson (Porous plug) experiment, conclusions and explanation, analytical treatment of Joule Thomson effect, Entropy, calculations of entropy of reversible and irreversible process, T-S diagram, entropy of a perfect gas, Nernst heat law (third law of thermodynamics); Liquefaction of gases, (oxygen, air, hydrogen and helium) solidification of helium below 4K, Cooling by adiabatic demagnetization		
II Sept 2024	**THERMODYNAMICS-II** Derivation of Clausius-Clapeyron and Clausius latent heat equations and their significance, specific heat of saturated vapours, phase diagram and triple point of a substance, development of Maxwell thermodynamical relations, Thermodynamical functions: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them, derivation of Maxwell thermodynamical relations from thermodynamical functions, Application of Maxwell relations: relations between two specific heats of gas, Derivation of Clausius-Clapeyron and Clausius equation, variation of intrinsic energy with volume for (i) perfect gas (ii) Vander wall gas (iii) solids and liquids, derivation of Stefan's law, adiabatic compression and expansion of gas & deduction of theory of Joule Thomson effect.		
III Oct 2024	**Statistical Physics-I** Distribution of N (for N= 2, 3, 4) distinguishable and indistinguishable particles in two boxes of equal size, microstates and macrostates, thermodynamical probability, constraints and accessible states, statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, β-parameter, entropy and probability; Concept of phase space, division of phase space into cells, postulates of statistical mechanics; Classical and quantum statistics, basic approach to these statistics, Maxwell-Boltzmann statistics applied to an ideal gas in equilibrium-energy distribution law, Maxwell's distribution of speed & velocity (derivation required), most		

	probable speed, average and r.m.s. speed, mean energy for Maxwellian distribution.
IV Nov 2024	**Statistical Physics-II** Dulong and Petit Law, derivation of Dulong and Petit law from classical physics; Need of Quantum statistics- classical versus quantum statistics, Bose-Einstein energy distribution Law, Application of B. E. Statistics to Planck's radiation law, degeneracy and B. E. condensation; Fermi-Dirac energy distribution Law, F. D. gas and degeneracy, Fermi energy and Fermi temperature; F. D. energy distribution Law for electron gas in metals, zero point energy, average speed (at 0 K) of electron gas
	Practicum 1. To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. 2. Measurement of Planck's constant using black body radiation. 3. To determine Stefan's Constant. 4. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus. 5. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. 6. To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method. 7. To determine the temperature co-efficient of resistance by Platinum resistance thermometer. 8. To study the variation of thermo emf across two junctions of a thermocouple with temperature. 9. To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system 10. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge 11. To prove the law of probability by using one coin, two coins and 10 or more coins. 12. To determine the coefficient of increase of volume of air at constant pressure. 13. To determine the coefficient of increase of pressure of air at constant volume. 14. Computer simulation of Maxwell-Boltzmann distribution, Fermi-Dirac & Bose-Einstein 15. Study of statistical distribution from the given data and to find most probable, average, and rms value 16. Mechanical Equivalent of heat (J) by Joule's calorimeter. 17. Heating efficiency of electrical kettle with varying voltage. **Note: Student will perform at least six experiments. The examiner will allot one practical at the time of end term examination.**

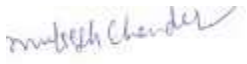
Summary of lesson plans of Govt college Faculty for Academic Session 2021-22

GOVT COLLEGE ISRANA

Name of Extension Lect. Dr Mukesh Chander

	Class BSc Sem 5th Sub. Physics
Date	**Topic Covered Paper 1**
July-Aug 2024	Overview, scale of quantum physics, boundary between classical and quantum phenomena, Photon, Photoelectric effect, Compton effect (theory and result), Frank-Hertz experiment, de-Broglie hypothesis. Davisson and Germer experiment
	G.P.Thomson experiment. Phase velocity, group velocity and their relation. Heisenberg's uncertainty principle. Time energy and angular momentum, position uncertainty. Uncertainty principle from de Broglie wave. (Wave-particle duality). Gamma Ray Microscope, Electron diffraction from a slit
	. Derivation of 1-D time-dependent Schrodinger wave equation (subject to force, free particle). Time-independent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Orthogonality and Normalization of function, concept of observer and operator. Expectation values of dynamical quantities, probability current density.
	Free particle in one-dimensional box (solution of Schrodinger wave equation, eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy). One dimensional step potential E > Vo (Reflection and Transmission coefficient) One dimensional step potential E < Vo (penetration depth calculation).
Sep 2024	One dimensional potential barrier, E > Vo (Reflection and Transmission coefficient) One-dimensional potential barrier, E < Vo (penetration or tunneling coefficient). Solution of Schrodinger equation for harmonic oscillator (quantization of energy, Zero-point energy, wave equation for ground state and excited states).
	Absorption and emission of radiation, Main features of a laser: Directionality, high intensity, high degree of coherence, spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer
	life time of a level,kinetics of optical absorption ((two and three level rate equation, Fuchbauer landerburg formula).population inversion: A necessary condition for light amplification, resonance cavity, laser pumping, Threshold condition for laser emission, line broadening mechanism, homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening).
	He-Ne laser and RUBY laser (Principle, Construction and working), Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working), Applications of lasers in the field of medicine and industry.
Date	**Topic Covered Paper 2**
Oct 2024	Nuclear composition (p-e and p-n hypotheses), Nuclear properties; Nuclear size, spin, parity, statistics, magnetic dipole moment, quadruple moment (shape concept). Determination of mass by Bain-Bridge, Bain-Bridge and Jordan mass spectrograph.
	Determination of charge by Mosley Law. Determination of size of nuclei by Rutherford Back Scattering. mass and binding energy, systematic of nuclear binding energy, nuclear stability
	Alpha-disintegration and its theory. Energetics of alpha-decay, Origin of continuous beta spectrum (neutrino hypothesis), types of beta-decay and energetics of beta-decay. Nature of gamma rays, Energetics of gamma rays.
	Interaction of heavy charged particles (Alpha particles); Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Range and straggling of alpha particles. Geiger-Nuttal law. Interaction of light charged particle (Beta-particle), Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles.
Nov 2024	Interaction of Gamma Ray; Passage of Gamma radiations through matter (Photoelectric, Compton and pair production effect) electron-positron annihilation. Absorption of Gamma rays (Mass attenuation coefficient) and its application.
	Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators. Gas filled counters; Ionization chamber, proportional counter, G.M. Counter (detailed study), Scintillation counter and semiconductor detector.
	Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration,

	Photonuclear reaction, Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions. Conservation laws, Q-value and reaction threshold.
	Nuclear Reactors, General aspects of Reactor Design. Nuclear fission and fusion reactors,(Principle, construction, working and use).



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