Amrut Sevabhavi Sanstha, Parbhani.
Late Ku. Durga K. Banmeru Science College,Lonar Dist-Buldhana.
Department of Physics
Teaching Plan Session:- 2023-24
Name :- Mr. Sharique S. Shaikh Class:-B.Sc. IIIrd Year /Sem. V Subject:- Physics
Paper:-5S-Quantum mechanics, Atomic spectroscopy ,Nuclear physics , hybrid parameters.

Sr. No.	Month	Name of Unit	Topics	Required Lect.	Total Lect.
1	July	Unit-I Origin of Quantum Mechanics	*Historical background, Failure of classical theory in explaining *Black body radiation & Photoelectric effect * Compton effect qualitative analysis * Assumption of Plank's quantum theory * Wave Particle Duality * De-Broglie Hypothesis * Davisson Germer expt. *Concept of Wave packet, Phase velocity , Group velocity relation * Heisenberg's uncertainty principal * Different forms * Thought expt.Gamma ray microscope	01 01 02 01 01 01 01 02 01 01 02	14
2	July/Aug.	Unit :- II The Schrodinger equation and its applications	* Wave function and its physical significance * Schrodinger time dependent equation * Separation in time dependent and time independent parts * Operators in quantum Mechanics * Eigen functions and Eigen values * Particle in one dimensional and three dimensional box (Energy eigen values) * Qualitative analysis of potential barrier Tunneling effect) * Simple Harmonic Oscillator (Qualitative analysis of Zero point	01 01 01 01 02 02 02 02	12
3	Aug./Sep	Unit- III Atomic and Molecular Spectroscopy	*Vector Atom Model: Quantum Numbers, *Stern- Gerlach experiment; *selection rules, l-s and j-j coupling *Types of spectra – Emission & absorption spectra. *X-rays: Continuous X-ray spectrum, *Duane and Hunt's law, *characteristic X-ray spectra, *Mosley's law *Raman Effect: stoke's and anti-stoke's lines,	01 02 01 01 01 01 01 01 01 01	11

			*Quantum theory of Raman effect, Experimental Arrangement for Raman Spectroscopy.		
4	Aug./Sept.	Unit:-IV Nuclear Physics	*Detection of charged particles; *G. M. counter, *Binding energy and Mass defect, stability of nuclei *Alpha Decay: Range of Alpha particles, *Geiger - Nuttal law and Gamow's explanation of alpha decay (qualitative)*Beta decay: Types and Pauli's Neutrino Hypothesis *Nuclear Fission, Nuclear fusion (concepts only), *Nuclear reactors.	01 02 02 01 02 02 02 01	13
5	Sep./Oct.	Unit:-V Hybrid parameters	*Hybrid parameters *low frequency equivalent of CE amplifier & its analysis., *Bias stability & thermal runway qual. *General principles of amplifier classification, *RC coupled amplifier, *Equivalent circuits & gain at low, medium & high frequency (qualitative), *Gain-frequency response. *Noise & distortion in electronic circuits.	01 02 02 01 01 02 01 02	12
6	Sep./Oct	Unit :- VI Feedback in amplifiers	*Feedback in amplifiers- Negative feedback, *Advantages of negative feedback, *positive feedback. *Phase shift, and Wein bridge *Hartley & Colpits Oscillators. *Multi-vibrators – astable, monostable & bistable.	01 01 01 02 02 03	10

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Department of Physics
Teaching Plan Session:- 2023-24
Name :- Mr. Sharique S. Shaikh Class:-B.Sc. IIIrd Year /Sem. VI
Paper:- (6S) Statistical mechanics & solid state physics.

Sr. No.	Month	Name of Unit	Topics	Required Lect.	Total Lect.
1	Dec./Jan	Unit-I Statistical mechanics	*Phase space , Unit cell *Microstates and Macro states *Energy states, Density of Energy states *Probability and most probable distribution *Boltzman entropy relation *Maxwell-Boltzman relation *Molecular speed distribution * r.m.s. speed and most probable velocity	01 01 01 02 01 01 01 01	09
2	Dec./Jan	Unit :- II Bose-Einstein statistics	*Distinguishable& Indistinguishable particles * Concept of boson and fermions * Bose-Einstein statistics * Black body radiation *Fermi-Dirac distribution * Fermi function * Fermi energy *Fermi temp.	02 01 02 01 01 01 01 01	10
3	Jan.	Unit:-III Crystallography	*Crystalline and Amorphous materials * Unit cell * Miller indices *Types of lattice * Coordination number * Diffraction of lattice parameter * Diffraction of X-rays by crystal *Bragg's law *Reciprocal lattice *Defects in solids	01 01 01 01 01 01 01 01 02	11
4	Jan./Feb	Unit:-IV Electrical properties of material	* Motion of electron * Electrical conductivity * Expn. For electrical conductivity and ohm's law * Fermi energy and density of states * Electron in periodic potential * Bloch theorem *Energy band , energy gap * Free electron model *Conductor's ,insulator's,	01 01 02 01 01 01 01 01	10

			semiconductor's		
5	Feb./Mar	Unit:-V Magnetic properties of materials	* Atomic magnetic moment *Magnetization vector (M) * Magnetic susceptibility * Diamagnetism, Paramagnetic, Ferromagnetism * Dia. Para-,and ferromagnetic materials * Langevin's theory of diamagnetism * Langevin's theory of Para magnetism * Quantum mechanical treatment of Para magnetism *Curie-Weiss's law *Hysteresis and energy loss	01 01 01 01 01 02 02 02 01 01	13
6	Feb./Mar.	Unit–VI Superconductivity and Nanotechnology	*Superconductivity *Critical temp. and critical magnetic field *Meissner effect *Type I and Type II Superconductor. *BCS Theory, cooper pair *Application of superconductor's *Effect of reduction of dim. of physical properties *History of nanotechnology *Quantum size effect *Application of Nano materials	01 01 01 01 02 01 01 01 01 01	12

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Department of Physics
Teaching Plan Session:- 2023-24
Name :- Mr. Sharique S. Shaikh Class:-B.Sc. II Year /Sem. III Subject:- Physics
Paper:-3S- Thermal Physics, Statistical Mechanics & Solid State Devices-I **(CBCS)**

Sr. No.	Month	Name of Unit	Topics	Required Lect.	Total Lect.
1	Aug.	Unit-I thermodynamics	Unit-I Introduction of laws of thermodynamics: Zeroth law, first law, second law, third law of thermodynamics and concept of entropy. Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and internal energy functions, Maxwell's relations & applications, Joule-Thomson effect, Clausius- Clapeyron equation, Expression for (CP – CV), CP/CV, TdS equations, Numerical	01 01 01 01 01 01 01 02 01 01 01	12
2	Aug.	Unit :- II Kinetic Theory of Gases	Kinetic Theory of Gases: Mean free path, Transport phenomena: viscosity, conduction and diffusion. Theory of radiation: Blackbody radiation, spectral distribution, concept of energy density, Wien's distribution law, Rayleigh-Jeans Law, Planck's quantum hypothesis, derivation of Planck's law, deduction of Wien's distribution law, Rayleigh- Jeans law, Stefan Boltzmann law and Wien's displacement law from Planck's law, Numerical.	01 01 01 01 02 02 02 01 01	12
3	Sept.	Unit- III Statistical Mechanics	Statistical Mechanics: Phase space, unit cell, macrostate and microstate, entropy and thermodynamic probability, Maxwell-Boltzmann law, distribution of velocity, Quantum statistics: Fermi-Dirac distribution law, electron gas, Bose-Einstein distribution law, photon gas, comparison of three statistics, Numerical	01 02 01 01 01 01 01 01 01 01 01	12

4	Sept.	Unit: -IV Semiconductor Devices	Semiconductor Devices: P-N junction diode, Zener diode and light emitting diode (construction, biasing, characteristics and applications) Rectifiers: Half wave rectifier, full-wave rectifier, bridge rectifier, ripple factor, rectification efficiency (Qualitative only) comparison of rectifiers. Filter circuits (Qualitative only): capacitor filter, inductor filter, L-section and π- section filter. Power Supply: Ordinary power supply, line and load regulation, regulated power supply, Zener diode as voltage regulator, Numerical. (12 Lectures)	01 01 01 01 01 01 01 01 01 01 01 01	12
5	Oct.	Unit: -V Transistor	Transistor: construction and working of PNP and NPN transistor, different modes, characteristics of transistor in CB and CE mode, current gain in CB and CE mode and relation between them, CE transistor amplifier, active, cut-off and saturation regions, dc load line, operating point. Junction Field Effect Transistor (JFET): Types, construction, working and characteristics, parameters of JFET and their relation, difference between JFET and BJT, Numerical.	01 02 01 01 01 02 01 02 01 01	12
6	Oct.	Unit: - VI Skill Enhancement Module (SEM)	Introduction to soldering Technique: Introduction, Types of solder, Solder flux, Soldering Irons and types, Contamination and cleaning of soldering iron, Desoldering techniques, Hazards involved in soldering. Breadboard: Introduction, basics and its connections. Regulated Power Supply: Definition, Block Diagram, Characteristics (Load and line regulation), its Application,	01 01 01 01 01 01 01 01 01 01	10

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Department of Physics
Teaching Plan Session: - 2023-24
Name: - Mr. Sharique S. Shaikh Class: -B.Sc. II Year /Sem. IV
Paper: - 4S Physical Optics, Fluid Dynamics & Solid State Devices-II **(CBCS)**

Sr. No.	Month	Name of Unit	Topics	Req. Lect.	Total Lect.
1	Jan	Unit I Interference of Light	Introduction, conditions for steady interference, Interference in thin film due to reflected and transmitted light, variable thickness (wedge shaped) film, Newton's rings (formation, theory and applications such as determination of wavelength and refractive index), Michelson Interferometer (principle, construction & working), Numerical.	01 01 02 02 01 01 01 01 01 01	12
2	Jan	Unit II Diffraction of Light	Rectilinear propagation of light, half period zones, zone plate (construction and theory), difference between zone plate and convex lens, Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction at double slit, theory of plane transmission grating, determination of wavelength of light by diffraction grating. Polarization: Transverse nature of light waves, plane polarized light, half and quarter wave plate, circular and elliptical polarization (production and analysis). Numerical.	01 01 01 01 01 01 01 01 01 01 01 01	12
3	Feb.	Unit III LASER:	Introduction, properties of Laser, stimulated absorption, spontaneous and stimulated emission, metastable state and population inversion. Components of Laser (active medium, pumping, optical resonant cavity), three level and four level laser system, construction and working of Ruby laser and Helium Neon (HeNe) laser. Applications of laser in medical and industrial field. Fibre Optics: Introduction, structure, types, total internal reflection, propagation of light wave through an optical fibre, acceptance angle and acceptance cone, numerical aperture. Numerical.	02 01 01 01 01 01 01 01 01 01 01	12

4	Feb.	Unit IV Kinematics of Moving Fluids:	viscosity, streamline and turbulent flow, critical velocity, equation of continuity, energy of the liquid, Bernoulli's theorem and its applications (Venturi meter, Atomizer), derivation of Poiseuille's equation for flow of liquid through a capillary tube, Reynold's number and its physical significance, terminal velocity, Stokes' law and its deduction. Numerical.	01 01 01 01 01 01 01 01 01 01 01 01	12
5	Mar.	Unit V Operational amplifier	: Differential Amplifiers, OP-AMP Block Diagram, Parameters of OP-AMP, Characteristics of Ideal OP-AMP, Inverting and Non-inverting amplifiers, Adder, Subtractor, Differentiator, Integrator. Sinusoidal Oscillators: Feedback in amplifier, Barkhausen Criterion, Phase Shift Oscillator (Construction and working), Oscillatory Circuit (Tank Circuit), Colpitt's and Hartley Oscillator (Construction and working). Numerical.	01 01 01 01 02 01 01 01 02 01	12
6	Mar.	Unit VI Skill Enhancement Module (SEM) Design and Handling of Microscopes and Telescopes	1.Optical Components in Microscopes and Telescopes • Objective lenses and eyepieces • Mirrors and prisms • Filters and diaphragms • Optical coatings and materials 2. Microscope Design and Operation • Compound and stereo microscope systems • Illumination techniques • Magnification and resolving power • Image formation and focusing mechanisms 3. Telescope Design and Operation • Refracting and reflecting telescope systems • Aperture and focal length considerations • Mounts and tracking mechanisms • Observing techniques and celestial objects 4. Alignment and Calibration Techniques • Aligning optical components in microscopes and telescopes • Collimation of telescopes • Testing and verification of alignment • Calibration of magnification and measurements 5. Handling and Maintenance of Microscopes and Telescopes • Proper handling techniques to avoid damage • Cleaning procedures for optical components • Environmental	02 02 02 01 01	10

			considerations for these instruments • Maintenance and troubleshooting common issues	02	

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Department of Physics
Teaching Plan Session:- 2023-24
Name :- Mr. Sharique S. Shaikh Class:-B.Sc. I Year /Sem. I Subject:- Physics
Paper:-1S- Mechanics, Properties of matters, Oscillations & Relativity **(CBCS)**

Sr. No.	Month	Name of Unit	Topics	Required Lect.	Total Lect.
1	Aug.	Unit I Rotational Dynamics	Rigid body, Torque, Rotation about fixed axis, Kinetic Energy of rotation, moment of inertia and its physical significance, Radius of gyration, Perpendicular and parallel axes theorem (Statement Only), Fly-wheel, Moment of inertia of different bodies (Rod, Disc, cylinder and sphere) about different axes, Rolling motion. Principle of Conservation of Angular momentum. Principle and working of Gyroscope. Numerical.	01 01 02 01 01 01 01 02 01 01	12
2	Aug.	Unit II SHM and its solution	, time period of simple pendulum, compound pendulum, kater's pendulum & Torsional pendulum; Bifilar pendulum (Qualitative). Damped Oscillations: Differential equation of damped harmonic oscillator and its solution, Energy equation of damped oscillations, Power dissipation and Quality factor. Forced Oscillations: Differential equation of forced oscillation (Qualitative), Resonance (Amplitude). Numericals	01 01 01 01 02 02 02 02	12
3	Sept.	Unit III Superposition of S.H.Ms.:	Superposition of two SHM of same frequency along the same line, superposition of two mutually perpendicular SHM of same frequency, Lissajous figures. Velocity of longitudinal waves (Newton's formula), Laplace correction, velocity of transverse waves in stretched string, Standing waves, Organ Pipe, harmonics and overtones. Velocity of waves by Kundt's tube. Ultrasonic waves: Production (piezoelectric crystal and Magnetostriction) and detection of ultrasonic waves and its applications in	01 02 01 01 01 01 01 01 01	12

			medical and industrial field. Numerical	01	
4	Sept.	Unit IV Elasticity:	Different types of elasticity, Twisting couple on a cylindrical rod or wire, Determination of modulus of rigidity by Maxwell needle, Torsional pendulum, Torsional oscillations, Modulus of rigidity of a material of wire by torsional pendulum, Beam, Bending of beam, Bending moment, External and internal bending moments, Cantilever, Expression for depression of a beam (i) loaded at one end and (ii) loaded at the center. Numerical	01 02 02 01 02 02 02 01	12
5	Oct.	Unit V Gravitation and Special Theory of Relativity	Kepler's laws of planetary motion (Statements only), Newton's law of gravitation, Variation of "g" with altitude and depth, weightlessness, Satellite in circular orbit and applications, Geosynchronous orbit, basic idea of Global Positioning System(GPS). Frame of reference, Inertial and Non-inertial frame of reference, Galilean transformation, Postulates of special theory of relativity, Lorentz transformation, length contraction, Time dilation, Einstein's mass energy relation. Numerical	01 02 01 01 01 02 01 02 01 01	12
6	Oct. /Nov.	Unit :- VI Skill Enhancement Module (SEM) Basics of Measurement Technique	Measurements: Significance of measurements, methods of measurements, Static and dynamic characteristics: Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements: Types of errors: i) Gross errors ii) Systematic errors iii) Random errors and loading effects. Statistical evaluation of measurement data: Arithmetic mean & median, Average deviation: Measurement with Screw Gauge, Vernier Caliper, Travelling Microscope, Spectrometer.	01 01 01 01 01 01 01 01 01 01	12

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Department of Physics
Teaching Plan Session:- 2023-24
Name :- Mr. Sharique S. Shaikh Class:-B.Sc. I Year /Sem. II
Paper:- 2S Electrostatics, Magnetostatics, Ultrasonic Waves and Acoustics, Network Theorems **(CBCS)**

Sr. No.	Month	Name of Unit	Topics	Req. Lect.	Total Lect.
1	Jan	Unit I Vector Analysis:	Scalar and Vector product, gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors. Numerical	02 01 02 01 02 01 02 01	12
2	Jan	Unit II Electrostatics:	Electrostatic 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. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Relation between electric field and electric potential. Numerical	01 01 01 01 01 01 01 01 01 01 01 01	12
3	Feb.	Unit III Capacitors:	Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric. Numerical	02 01 01 01 01 01 01 02 01 01	12
4	Feb. /Mar.	Unit IV Magnetostatics:	Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field. Numerical	01 01 01 01 01 01 01	12

5	Mar.	Unit V Network Theorems	: Series circuit, Series voltage dividers, Parallel circuits, Series Parallel circuits, Resistances in series and parallel, Kirchhoff's Current and Voltage laws, Wheatstone's Bridge, Ideal constant voltage source, Ideal constant current source, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Milliman's theorem, Numerical	01 01 01 01 01 01 01 01 01 02 01	12
6	Apr.	Unit VI Skill Enhancement Module (SEM) Multimeter	Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. Introduction to electrical components: Resistor-Types of Resistors, Color coding - Applications of a Resistor as a heating element in heaters and as a fuse element. Capacitor- Types of Capacitor, Color coding, Applications of Capacitor in power supplies, motors (Fans) etc. Inductor-Types of Inductors, EMF induced in an Inductor, Applications of Inductor in a fan, radio tuning 6 circuit and Series resonance circuit. Energy audit: Unit of electricity, power of domestic appliances.	02 02 02 02 02	12

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