Govt. College Mangali- Lesson Plan **Even Sem 2024-25 (Dept. of Physics)**

Academic Calender- Even Sem 2024-25	
Teaching-I	01.01.2025 to 08.03.2025
Vacations(Holi)	09.03.2025 to 16.03.2025
Teaching-II	17.03.2025 to 30.04.2025
End Semester Examinations (Major Test)(for UTD and Affiliated Colleges)	01.05.2025 onwards
Summer Vacations (for UTD)	20.05.2025 to 30.06.2025
Summer Vacations (for Affiliated Colleges)	27.05.2025 to 07.07.2025

Name of Teacher: Dr. Manjeet Singh **Class:** B. Sc. IVth Sem **Session:** 2024-25
Subject: Physics **Nomenclature of Paper:** Statistical Mechanics **Paper Code: CPL-402**

Week	**Jan 25/Duration**	**Topic-** Unit-I
1	01 Jan-04 Jan	Statistical Basis, Probability and Frequency, Permutations and Combinations, Distribution of n distinguishable and indistinguishable particles in two boxes, Macrostate and Microstate,
2	06 Jan-11 Jan	Thermodynamic Probability, Fluctuations and their Dependence on n: (narrowing of probability distribution with increasing n),
3	12 Jan-18 Jan	Constraints on a System, Static and dynamics system, most probable state, Concept of cell in a compartment, Concept of Ensembles and type of Ensembles (Qualitative Idea only)
4	19 Jan-25 Jan	Universal Law in Statistics: - Fundamental Postulates of Statistical Mechanics, Density of Quantum states of energy of a particle, Entropy and thermodynamics Probability,
5	27 Jan-31 Jan	Statistical Interpretation of 2nd law of thermodynamics, Partition function and Relation with Thermodynamics Quantities. **Assignment and Test**
Week	**Feb25/Duration**	**Topic-** Unit-II
1	01 Feb-08 Feb	Kinetic Theory of Gases: - Maxwell-Boltzmann Law of Distribution of Particle speed in an Ideal Gas and its Experimental Verification,
2	10 Feb-15 Feb	Mean, RMS and Most Probable Speeds. Molecular Collisions: - Mean Free Path. Collision Probability, Estimates of Mean Free Path
3	17 Feb-22 Feb	Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity (3) Diffusion. Brownian Motion and its Significance. Equipartition Law: Degrees of Freedom,
4	24 Feb-28 Feb	Law of Equipartition of Energy (No proof required) and its application to the specific heat of monoatomic and diatomic gases and its limitations. **Assignment and Test**
Week	**March25/Duration**	**Topic-** Unit-III
1	01 March-08 March	Classical Statistics: - Phase space and Application to One Dimension Harmonic Oscillator and Free particle
2	17 March-22 March	Division of phase space into cells, Basic approach in three statistics, Maxwell-Boltzmann Distribution Law **Assignment and Test**
3	24 March- 31 March	Thermodynamic Functions of Finite Number of Energy Levels, Negative Temperature, Thermodynamic Functions of an Ideal Gas, Classical Entropy Expression, Gibbs Paradox.
Week	**April25/Duration**	**Topic-** UNIT-IV
1	01 April -05 April	Bose-Einstein Statistics: - B.E. distribution law, Thermodynamic functions of a Completely Degenerate Bose Gas,)
2	07 April -12 April	Bose-Einstein condensation, properties of liquid He (qualitative description
3	14 April -19 April	Radiation as photon gas, Bose's derivation of Planck's law
4	21 April-26 April	Fermi-Dirac Statistics: - Fermi-Dirac Distribution Law, Thermodynamic functions of an ideal Completely Degenerate,
5	28 April-30 April	Fermi Gas, Fermi Energy, Electron gas in a Metal, Specific Heat of Metals, Comparison of three statistics M-B, B-E and F-D. **Assignment and Test**

Name of Teacher: Dr. Manjeet Singh	**Class:** B. Sc. IVth Sem	**Session:** 2024-25
Subject: Physics	**Nomenclature of Paper:** Waves and Optics	**Paper Code: CPL-403**
Week	**Jan 25/Duration**	**Topic-** Unit-I
1	01 Jan-04 Jan	**Wave Motion:** Wave Equation, Solution of wave equation, Particle and Wave Velocities, Intensity of Wave, Superposition Principle, Group velocity, Phase velocity
2	06 Jan-11 Jan	**Transverse Waves:** The string as a force oscillator, Velocity of Transverse Vibrations of Stretched Strings, Reflections and transmission of waves on a string at a boundary,
3	12 Jan-18 Jan	Transverse waves on a string, Travelling and standing waves on a string, Normal Modes of a string, Reflections and transmission of Energy.
4	19 Jan-25 Jan	**Longitudinal Waves:** Velocity of Longitudinal Waves in a Fluid in a Pipe, Newton's Formula for Velocity of Sound, Laplace's Correction (qualitative),
5	27 Jan-31 Jan	Reflections and transmission of sound waves at a boundary, Energy distribution in sound waves. **Assignment and Test**
Week	**Feb25/Duration**	**Topic-** Unit-II
1	01 Feb-08 Feb	**Interference:** Division of amplitude and division of wave front, Young's Double Slit experiment
2	10 Feb-15 Feb	Lloyd's Mirror and Fresnel's Biprism
3	17 Feb-22 Feb	Phase change on reflection: Stokes' treatment, Interference in Thin Films: parallel and wedge-shaped films
4	24 Feb-28 Feb	Newton's Rings: measurement of wavelength and refractive index **Assignment and Test**
Week	**March25/Duration**	**Topic-** Unit-III
1	01 March-08 March	**Diffraction:** Fresnel Diffraction: Fresnel's Assumptions, Fresnel's Half-Period Zones for Plane Wave, Rectilinear Propagation of Light, Theory of a Zone Plate and its application, Multiple Foci of a Zone Plate
2	17 March-22 March	Qualitative description for Fresnel diffraction pattern of a straight edge, a slit and a wire. **Assignment and Test**
3	24 March- 31 March	Fraunhofer diffraction: Single slit, Double slit multiple slits and 'n' multiple slits, Diffraction grating and it's resolving power, Rayleigh Criteria of the limit of resolution and Resolving Power of a telescope.
Week	**April25/Duration**	**Topic-** UNIT-IV
1	01 April -05 April	**Polarization:** Plane polarized light – production and analysis
2	07 April -12 April	Circular and elliptical polarization, Optical activity, Specific Rotation
3	14 April -19 April	**Fibre Optics:** Optical Fibres - Construction and working, Critical angle of propagation
4	21 April-26 April	Modes of propagation, Acceptance angle, Attenuation
5	28 April-30 April	Advantages and applications of Optical Fibre **Assignment and Test**

Name of Teacher: Dr. Manjeet Singh	**Class:** B. Sc. IVth Sem	**Session:** 2024-25
Subject: Physics	**Nomenclature of Paper:** SEC- Electrical Circuits and Network Skills	**Paper Code: CPS-409**

Week	**Jan 25/Duration**	**Topic-** Unit-I
1	01 Jan-04 Jan	**Basic Electrical Components**: Electronic components. Passive components. Resistors and their types. Color coding of resistors.
2	06 Jan-11 Jan	Troubles in resistors. Capacitors and their types. Troubles in capacitors. Inductors and their types.
3	12 Jan-18 Jan	Troubles in inductors. Internal resistance and impedance.
4	19 Jan-25 Jan	Types of Electrical switches. "Single-pole Single-throw" (SPST) switch. "Single-pole Double-throw" (SPDT) switch. "Double-pole Double-throw" (DPDT) switch. Application of SPST , SPDT and DPDT switches.
5	27 Jan-31 Jan	**Assignment and Test**
Week	**Feb25/Duration**	**Topic**
1	01 Feb-08 Feb	**Electrical Protection and Electrical Wiring**: Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection
2	10 Feb-15 Feb	Grounding and isolating. Construction and working of MCB & MCCB and their uses.
3	17 Feb-22 Feb	Different types of conductors and cables. Basics of wiring - Star and delta connection. Voltage drop and losses across cables and conductors.. Insulation. Solid and stranded cable. Preparation of extension board
4	24 Feb-28 Feb	**Assignment and Test**
Week	**March25/Duration**	**Topic-** Unit-II
1	01 March-08 March	**Electrical Energy Sources and Measurements:** Real (practical) and ideal voltage source. Real (practical)current source. Conversion of voltage source into current source or vice-versa
2	17 March-22 March	Maximum power transfer theorem. Thevenin theorem and norton's theorem. Familiarization with multimeter. Voltmeter and ammeter.
3	24 March- 31 March	AC source -single phase and three phase alternating current sources. Measurement of energy consumption in AC circuits.
Week	**April25/Duration**	**Topic**
1	01 April -05 April	**Digital Circuits:** Difference between Analog and Digital Circuits, Binary Numbers,
2	07 April -12 April	Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates,
3	14 April -19 April	Realization of AND, OR and NOT Gates using Diodes, resistances and Transistor, NAND and NOR Gates as Universal Gates,
4	21 April-26 April	Realization of AND, OR and NOT Gates using NAND Gates only and NOR Gates only, XOR gates, XNOR Gates,De Morgan's Theorems, Boolean Laws.
5	28 April-30 April	Advantages and applications of Optical Fibre **Assignment and Test**

Name of Teacher: Dr. Manjeet Singh	**Class:** B. Sc. VIth Sem	**Session:** 2024-25
Subject: Physics	**Nomenclature of Paper:** Solid State Physics	**Paper Code:** CPL 601
Week	**Jan 25/Duration**	**Topic-** Unit-I
1	01 Jan-04 Jan	**Crystal Structure I:** Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis
2	06 Jan-11 Jan	Crystal translational vectors and axes. Unit cell and Primitive Cell,
3	12 Jan-18 Jan	Winger Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions.
4	19 Jan-25 Jan	Crystal planes and Miller indices, Inter-planer spacing, Crystal structures of Zinc Sulphide, Silicon, Sodium Chloride and Diamond.
5	27 Jan-31 Jan	**Assignment and Test**
Week	**Feb25/Duration**	**Topic-** Unit-II
1	01 Feb-08 Feb	**Crystal Structure II:** X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods.
2	10 Feb-15 Feb	K-space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c
3	17 Feb-22 Feb	**Lattice vibrations**: Phonon concept, Vibration of monoatomic and diatomic lattice, Acoustical and optical modes
4	24 Feb-28 Feb	Dispersion relation for phonons, Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids, Debye T^3 law **Assignment and Test**
Week	**March25/Duration**	**Topic-** Unit-III
1	01 March-08 March	**Band Theory:** Free electron gas models, Nearly free electron model, Bloch function, Kronig Penny model
2	17 March-22 March	Velocity and Effective mass of electron, Distinction between metals, semiconductors and insulators, Hall Effect
3	24 March- 31 March	**Magnetic Properties of Matter:** Dia-, Para-, Ferromagnetic Materials, Classical Langevin Theory of dia - and Paramagnetic Domains, Curie's law. **Assignment and Test**
Week	**April25/Duration**	**Topic-** Unit-IV
1	01 April -05 April	**Super Conductivity:** Historical introduction
2	07 April -12 April	Survey of superconductivity, Super conducting systems
3	14 April -19 April	High T_c Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect
4	21 April-26 April	London Theory and Penetration Depth, Classification of Superconductors (type I and Type II)
5	28 April-30 April	BCS Theory of Superconductivity, Flux quantization, Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations. **Assignment and Test**

Name of Teacher: Dr. Manjeet Singh	**Class:** B. Sc. VIth Sem	**Session:** 2024-25
Subject: Physics	**Nomenclature of Paper:** Quantum Mechanics	**Paper Code:** CPL 602

Week	**Jan 25/Duration**	**Topic-** Unit-I
1	01 Jan-04 Jan	**Basics of Quantum Mechanics:** Wave function and its physical significance, Properties of wave-function,
2	06 Jan-11 Jan	Orthogonality and Normalization of wave function, Time dependent Schrodinger wave equation, Time Independent Schrodinger Equation
3	12 Jan-18 Jan	Momentum and Energy operators; Hermitian Operators- Eigenvalue and Eigen functions, Commutator relations of various operators,
4	19 Jan-25 Jan	Stationary states; Probabilities and normalization, Probability current densities and its relation to wavefunction
5	27 Jan-31 Jan	Expectation Values of Dynamical quantities, Particle in 1-dimention Infinite Square Well (Energy levels and general Wavefunction) **Assignment and Test**
Week	**Feb25/Duration**	**Topic-** Unit-II
1	01 Feb-08 Feb	**Application of Schrodinger Wave Equation:** Solution of Schrodinger Equation for the Finite Potential Well,
2	10 Feb-15 Feb	1-Dimention Harmonic Oscillator problem - Algebraic and Analytical solutions, Free particle and concept of group velocity,
3	17 Feb-22 Feb	Tunneling through finite potential barrier - Examples of alpha decay and tunnel diodes (qualitative only)
4	24 Feb-28 Feb	Generalized uncertainty principles for Position-Momentum and Energy **Assignment and Test**
Week	**March25/Duration**	**Topic-** Unit-III
1	01 March-08 March	Larmor's precession, Spectroscopic terms and their notation, Selection rule, Orbital magnetic dipole moment (Bohr magneton),
2	17 March-22 March	Coupling scheme; LS or Russel-Saunders Coupling scheme
3	24 March- 31 March	JJ coupling scheme, Pauli principal, Hyperfine structure of spectral lines and its origin, isotopic effect, Atom in external magnetic field; Normal Zeeman effect **Assignment and Test**
Week	**April25/Duration**	**Topic-** Unit-IV
1	01 April -05 April	Rotational spectra of diatomic molecules as rigid rotator, energy levels,
2	07 April -12 April	Rotational spectra of diatomic molecules as non-rigid rotator, Intensity of rotational lines
3	14 April -19 April	Vibrational spectra
4	21 April-26 April	Vibrational-Rotational, Raman and electronic spectra of molecules: Vibrational energy of diatomic molecules
5	28 April-30 April	Molecules as Harmonic Oscillator, **Assignment and Test**

Name of Teacher: Dr. Manjeet Singh	**Class:** B. Sc. IInd Sem	**Session:** 2024-25
Subject: Physics	**Nomenclature of Paper: DSC**-Electricity and Magnetism	**Paper Code:** C24PHY201T
Week	**Jan 25/Duration**	**Topic-** Unit-I
1	01 Jan-04 Jan	**Vector Background** a**nd Electric Field**: Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field,
2	06 Jan-11 Jan	Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem. Conservative nature of Electrostatic Field,
3	12 Jan-18 Jan	Electrostatic Potential, Potential as line integral of field, potential difference Derivation of electric field E from potential as gradient. Derivation of Laplace and Poisson equations.
4	19 Jan-25 Jan	Electric flux, Gauss's Law, Differential form of Gauss's law and applications of Gauss's law.
5	27 Jan-31 Jan	**Assignment and Test**
Week	**Feb25/Duration**	**Topic-** Unit-II
1	01 Feb-08 Feb	**Magnetic Field:** Biot-Savart law and its applications: straight wire and circular loop, Current Loop as a Magnetic Dipole and its Dipole Moment, Ampere's Circuital Law, and its applications to (1) Solenoid and (2) Toroid,
2	10 Feb-15 Feb	**Magnetic Properties of Matter:** Force on a dipole in an external field, Electric currents in Atoms, Electron spin and Magnetic moment, types of magnetic materials, Magnetization vector (M), Magnetic Intensity (H),
3	17 Feb-22 Feb	Magnetic Susceptibility and permeability, Relation between B, H and M, Electronic theory of dia and paramagnetism,
4	24 Feb-28 Feb	Domain theory of ferromagnetism (Langevin's theory), B-H curve and hysteresis loop, importance of Hysteresis loop. **Assignment and Test**
Week	**March25/Duration**	**Topic-** Unit-III
1	01 March-08 March	**Time varying electromagnetic fields:** Electromagnetic induction, Faraday's laws of induction and Lenz's Law, Self-inductance, Mutual inductance, Energy stored in a Magnetic field,
2	17 March-22 March	Derivation of Maxwell's equations, Displacement current, Maxwell's equations in differential and integral form and their physical significance. **Electromagnetic Waves:** Electromagnetic waves, Transverse nature of electromagnetic wave,
3	24 March- 31 March	Energy transported by electromagnetic waves, Poynting vector, Poynting's theorem. Propagation of Plane electromagnetic waves in free space & Dielectrics **Assignment and Test**
Week	**April25/Duration**	**Topic-** Unit-IV
1	01 April -05 April	**DC current Circuits:** Electric current and current density, Electrical conductivity, and Ohm's law, Kirchhoff's laws for D.C. networks,
2	07 April -12 April	Network theorems: Thevenin's theorem, Norton theorem, Superposition theorem.
3	14 April -19 April	**Alternating Current Circuits:** A resonance circuit, Phasor, Complex Reactance and Impedance
4	21 April-26 April	Analysis for RL, RC and LC Circuits, Series LCR Circuit: (1) Resonance, (2) Power Dissipation
5	28 April-30 April	(3) Quality Factor and (4) Band Width, Parallel LCR Circuit. **Assignment and Test**