ACADEMIC PLANNER & UNITIZATION OF SYLLABUS
ACADEMIC YEAR 2023-24.
DEPARTMENT : Physics NEP **CLASS : II Sem**
Paper II -Phy-DSCT 2:
Electricity and Magnetism

Week/Month	**CLASS**	**Portions Planned for 1 hour**	**Teacher**
April 1st week	1	Electric charge and field: Coulomb's law, electric field strength	
	2	Conductors in electrostatic field: Conductors and insulators, conductors in electric field.	
	3	Magnetism Definition of magnetic field, Ampere's law	KSS
	4	Electromagnetic waves: Equation of continuity, Maxwell's equations	KSS
April 2nd week	1	Electric field lines, point charge in an electric field and electric dipole,	
	2	Capacitance and capacitors,. expression for capacitance in a parallel plate capacitor,.	
	3	Biot-savart law(magnetic force and magnetic flux),magnetic force on a current carrying conductor	KSS
	4	Maxwell's equations, displacement current	KSS
April 3rd week	1	work done by a charge (derivation of the expression for potential energy) and problems	
	2	Parallel plate capacitor with dielectric,	
	3	Lorentz force, Hall effect in a conductor. Electromagnetic induction, Faraday's laws of induction	KSS
	4	Equation for propagation of electro magnetic wave,.	KSS
April 4th week	1	Gauss law: Gauss's law and its	
	2	Dielectrics: an atomic view Energy stored in a capacitor,	
	3	Lenz's law, expression for self inductance and energy stored in a magnetic field AC Circuits RMS and Average value of AC , Response of RL,RC and RLC circuits using j operator method, quality factor admittance and impedance power and energy in AC circuits	KSS
	4	Transverse nature of electro magnetic wave, energy transported by electromagnetic wave	KSS

May 1thweek	1	Applications - electric fields of a (i) spherical charge distribution, (ii) line charge and(iii) an infinite flat sheet of charge and problems	
	2	Dielectric and Gauss's law and problems	
	3	Mutual inductance .conducting rod in a magnetic field Problems	KSS
	4	Problems	KSS
May 2nd week	1	Electrostatic potential Electric potential, line integral, gradient of a scalar function, relation between field and potential	
	2	DC currents: Electric currents and current density.	
	3	AC Circuits RMS and Average value of AC	KSS
	4	Poynting vector, magnetic moment of a point charge moving in a circular loop	KSS
May 3rd week	1	Potential due to point charge and distribution of charges (Examples: potential associated with a spherical charge distribution, infinite line charge distribution, infinite plane sheet of charges).	
	2	Electrical conductivity and Ohm's law (Review). Network theorems (Thevenin's theorem	
	3	Response of RL circuit using j operator method	KSS
	4	electric current in atoms, electron spin and magnetic moment	KSS
May 4th week	1	Constant potential surfaces	
	2	Superposition theorem	
	3	Response of RC circuit using j operator	KSS
	4	Magnetic materials: magnetic intensity and magnetic induction, intensity of magnetisation	KSS
June 1st	1	Potential due to a dipole and electric quadrupole and problems.	
	2	Maximum power transfer theorem),	
	3	Response of RLC circuit using j operator	KSS
	4	Susceptibility, permeability,	KSS
June 2nd week	1	Superposition- (2) different frequencies (Beats) – Analytical treatment. Beats	
	2	maximum power transfer theorem), Problems	
	3	Quality factor admittance and impedance power in AC circuits	KSS
	4	Types of magnetic materials, diamagnetic paramagnetic and ferromagnetic materials.	KSS
June 3rd week	1	Superposition of two perpendicular harmonic oscillations:	
	2	Transient currents in RC, LR circuits	

	3	Energy in AC circuits	KSS
	4	Classical Langevin's theory of diamagnetism	KSS
June 4th week	1	Lissajous Figures with equal frequency- Analytical treatment.. Uses of Lissajous' figures	
	2	Transient currents in LCR circuits, Problems	
	3	Problems	KSS
	4	B-H hysteresis curve ,Hard and soft magnetic materials	KSS
July 1st week	1	Revision	
	2	Revision	
	3	Revision	KSS
	4	Revision	KSS
July 2nd week	1	Revision and test	
	2	Revision and test	
	3	Revision and test	KSS
	4	Revision and test	KSS

ACADEMIC PLANNER & UNITIZATION OF SYLLABUS
ACADEMIC YEAR 2023-24.
DEPARTMENT : Physics NEP CLASS : IV Sem
Paper IV -Phy-DSCT 4:
Thermal physics and Electronics

Week/Month	CLASS	Portions Planned for 1 hour	Teacher
April 1st week	1	Laws of Thermodynamics: Review of the concepts of Heat and Temperature	KSS
	2	Thermodynamic Potentials: Internal Energy, Enthalpy,	KSS
	3	Semiconductor devices	
	4	Electronics: Integrated Circuits,	
April 2nd week	1	The zeroth law of thermodynamics, Thermodynamic variables - extensive and intensive, Equations of state, PV diagrams.	KSS
	2	Helmholtz Free Energy, Gibb's Free Energy, properties and significance	KSS
	3	Intrinsic semiconductors - concept of holes – effective mass -	
	4	Operational Amplifier, Ideal characteristics of Op-Amp,	
April 3rd week	1	First Law of Thermodynamics: Differential form of the First Law of Thermodynamics,	KSS
	2	Maxwell's Thermodynamic Relations: Maxwell's thermodynamic relations (using Thermodynamic potentials),	KSS

	3	Concept of holes – Effective mass	
	4	Basic concepts of feedback and virtual ground,	
April 4th week	1	Application of the first law for (i) Cyclic Process (ii) Adiabatic Process (iii) Isochoric Process (iv) Isobaric Process and (v) Isothermal Process.	KSS
	2	Applications of Maxwell's Relations (1) Gibbs potential, First order Phase Transitions with examples	KSS
	3	Expression for carrier concentration of holes and electrons -	
	4	Inverting and NonInverting Configurations.	
May 1thweek	1	Equation of state for an adiabatic process (derivation)	KSS
	2	(2) Clausius - Clapeyron Equation.	KSS
	3	Electrical conductivity.	
	4	Applications- Voltage Follower, Addition and Subtraction.	
May 2nd week	1	Work done in an isothermal and adiabatic process for an ideal gas	KSS
	2	Joule-Thomson effect, Liquefaction of gases, Linde's air liquefier	KSS
	3	Extrinsic semiconductors and electrical conductivity (qualitative),	
	4	Applications-Addition and Subtraction.	
May 3rd week	1	Internal Energy as a state function	KSS
	2	Kinetic Theory of Gases:	KSS
	3	p-n junction and its characteristics,	
	4	Digital Electronics: Analog and Digital circuits,	
May 4th week	1	Second Law of Thermodynamics: Second law of thermodynamics (Kelvin's & Clausius' statements and their equivalence);	KSS
	2	Maxwell's law of distribution of velocity (without derivation),	KSS
	3	Zener diode as voltage regulator- load and line regulation.	
	4	Switching and Logic Levels,	
June 1st	1	Reversible and irreversible processes with examples;	KSS
	2	Deduction of most probable velocity, mean velocity and root mean square velocity,	KSS
	3	Junction Transistors: Basics of Bipolar Junction Transistors (BJT),	
	4	Digital Waveform. Number Systems: Decimal Number System,	
June 2nd week	1	Heat engines: Carnot Engine; Carnot Cycle and its efficiency(derivation),	KSS
	2	Degrees of Freedom, Law of Equipartition of Energy.	KSS

	3	BJT operation, Common Base, Common Emitter and Common	
	4	Binary Number System, Converting Decimal to Binary, Hexadecimal Number System:	
June 3rd week	1	Practical internal combustion engines - Otto and Diesel Cycles Carnot theorem, (qualitative treatment	KSS
	2	Derivation of Specific heats of ideal gas.	KSS
	3	Transistor - Collector Characteristics.	
	4	Converting Binary to Hexadecimal, Hexadecimal to Binary.	
June 4th week	1	Refrigerator- Coefficient of performance. Concept of Entropy, Second Law of Thermodynamics in terms of Entropy,	KSS
	2	Black body radiation and its spectral energy distribution;	KSS
	3	Field Effect Transistor (FET) and its characteristics	
	4	Digital Circuits: Logic gates, NOT Gate, AND Gate,	
July 1st week	1	Entropy in reversible process, Entropy in irreversible process, Principle of increase of entropy, Entropy change in (i) adiabatic process (ii) free expansion (iii) cyclic process (iv) isobaric process	KSS
	2	Kirchhoff's law, Stefan's law and Stefan-Boltzmann's law, Wien's displacement law, Rayleigh-Jeans law (Statements),	KSS
	3	Transistor as a CE-Amplifier (qualitative)	
	4	OR Gate, NAND Gate, NOR Gate, XOR Gate, Algebraic Simplification,	
July 2nd week	1	Third Law of Thermodynamics(Nernst Heat theorem): Statement, Significance and Unattainability of Absolute Zero	KSS
	2	Planck's law (derivation)– deduction of Wien's Law & Rayleigh – Jeans Law.	KSS
	3	Oscillator (Phase shift)	
	4	De Morgan's theorem, Realisation of NAND and NOR functions using TTL.	
July 3rd week	1	Revision	KSS
	2	Revision	KSS
	3	Revision	
	4	Revision	
July 4th week	1	Revision and Test	KSS
	2	Revision and Test	KSS
	3	Revision and Test	

	4	Revision and Test	

ACADEMIC PLANNER & UNITIZATION OF SYLLABUS
ACADEMIC YEAR 2023-24.
DEPARTMENT : Physics NEP CLASS : VI Sem
Paper VI -Phy-DSCT 7:
Elements of Condensed Matter & Nuclear Physics

Week/Month	CLASS	Portions Planned for 1 hour	Teacher
April 1st week	1	Crystal systems and X-rays: Crystal structure:	KSS
	2	Magnetic Properties of Matter,	KSS
	3	General Properties of Nuclei:	
	4	Interaction of Nuclear Radiation with matter:	
April 2nd week	1	Space Lattice, Lattice translational vectors,	KSS
	2	Review of basic formulae: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, magnetization (M),	KSS
	3	Constituents of nucleus and their intrinsic properties,	
	4	Gamma ray interaction through matter, photoelectric effect,	
April 3rd week	1	Basis of crystal structure, Types of unit cells, primitive, non-primitive cells.	KSS
	2	Classification of Dia, Para, and ferro magnetic materials;	KSS
	3	Quantitative facts about mass, radii, charge density (matter density),	
	4	Compton scattering, pair production,	
April 4th week	1	Seven crystal system, Coordination numbers, Miller Indices,	KSS
	2	Langevin Classical Theory of dia – and Paramagnetism.	KSS
	3	Binding energy	
	4	Energy loss due to ionization (quantitative description of Bethe Block formula),	
May 1thweek	1	Expression for inter planner spacing for cubic crystal. X Rays: X – Rays Production and properties of X rays, Coolidge tube,	KSS
	2	Curie's law,	KSS
	3	Main features of binding energy versus mass number curve,	
	4	Energy loss of electrons, introduction of Cerenkov radiation	
May 2nd	1	Continuous and characteristic X-ray spectra;	KSS

week		Moseley's law. X-Ray diffraction, Scattering of X-rays,	
	2	Ferromagnetism and Ferromagnetic Domains (qualitative).	KSS
	3	Angular momentum, parity,	
	4	Detector for Nuclear Radiations: Gas detectors:	
May 3rd week	1	Bragg's law. Crystal diffraction: Bragg's X-ray spectrometer- powder diffraction method, Intensity vs 2□ plot (qualitative).	KSS
	2	Discussion of B-H Curve. Hysteresis and Energy Loss,	KSS
	3	Magnetic moment, electric moments	
	4	Gas detectors Estimation of electric field,	
May 4th week	1	Free electron theory of metals: Classical free electron model (Drude-Lorentz model),	KSS
	2	Hard and Soft magnetic materials	KSS
	3	Radioactivity decay: Radioactivity: definition of radioactivity,	
	4	Mobility of particle, for ionization chamber and GM Counter.	
June 1st	1	Expression for electrical and thermal conductivity, Weidman-Franz law,	KSS
	2	Dielectrics: Static dielectric constant,	KSS
	3	Half-life, mean life,	
	4	Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT).	
June 2nd week	1	Failure of classical free electron theory; Quantum free electron theory, Fermi level and Fermi energy, Fermi-Dirac distribution function (expression for probability distribution F(E), statement only);	KSS
	2	Polarizability (electronic, ionic and orientation),	KSS
	3	Radioactivity equilibrium (a) Alpha decay: basics of α-decay processes,	
	4	Construction of photo-multiplier tube (PMT).	
June 3rd week	1	Fermi Dirac distribution at T=0 and E<Ef, at T□ 0 and E>Ef, F(E) vs E plot at T = 0 and T□ 0. Density of states for free electrons (statement only, no derivation).	KSS
	2	Calculation of Lorentz field (derivation),	KSS
	3	Theory of α emission (brief), Gamow factor, Geiger-Nuttall law.	
	4	Semiconductor Detectors (Si and Ge) for charge particle and photon detection (concept of charge carrier and mobility) qualitative only,	
June 4th week	1	Qualitative discussion of lattice vibration and Concept of Phonons.; Specific heats of solids:	KSS
	2	Clausius-Mosotti equation (derivation),	KSS

		dielectric loss. Piezo electric effect, cause, examples and applications.	
	3	(b) β-decay: energy kinematics for βdecay, positron emission, electron capture, neutrino hypothesis.	
	4	Accelerators: Cyclotrons.	
July 1st week	1	Classical theory, Einstein's and Debye's theory of specific heats.	KSS
	2	Superconductivity: Definition,Experimental results – Zero resistivity and Critical temperature	KSS
	3	(c) Gamma decay:	
	4	Cyclotron	
July 2nd week	1	Hall Effect in metals.	KSS
	2	The critical magnetic field – Meissner effect, Type I and type II superconductors.	KSS
	3	Gamma rays' emission & kinematics, internal conversion (Definition).	
	4	Synchrotrons	
July 3rd week	1	Revision	KSS
	2	Revision	KSS
	3	Revision	
	4	Revision	
July 4th week	1	Revision and Test	KSS
	2	Revision and Test	KSS
	3	Revision and Test	
	4	Revision and Test	

ACADEMIC PLANNER & UNITIZATION OF SYLLABUS
ACADEMIC YEAR 2023-24.
DEPARTMENT : Physics NEP CLASS : VI Sem
Paper VI -Phy-DSCT 8:
Electronic Instrumentation & Sensors

Week/Month	**CLASS**	**Portions Planned for 1 hour**	**Teacher**
April 1st week	1	Power supply AC power and its characteristics,	KSS
	2	Wave form generators and Filters	KSS
	3	Data Conversion and display Digital to Analog (D/A) and Analog to Digital (A/D) converters	
	4	Transducers and sensors Definition	
April 2nd week	1	Single phase and three phase,	KSS
	2	Basic principle of standard AF signal generator:	KSS
	3	A/D converter with preamplification and	

		filtering. D/A converter	
	4	Types of transducers.	
April 3rd week	1	Need for DC power supply and its characteristics, line voltage and frequency,	KSS
	2	Types wave forms. Fixed frequency and variable frequency,	KSS
	3	Variable resistor network,	
	4	Basic characteristics of an electrical transducer	
April 4th week	1	Half wave and Full wave (Bridge) Rectifier, ripple factor,LC	KSS
	2	AF sine wave generator:	KSS
	3	Ladder type (R-2R) D/A converter,	
	4	Factors governing the selection of a transducer,	
May 1thweek	1	Full wave rectifier and Bridge rectifier	KSS
	2	Phase shift and Wein-bridge oscillators using op-amp-	KSS
	3	Op-amp based D/A converter.	
	4	Resistive transducer-potentiometer,	
May 2nd week	1	Filters: T-section and π-section filters,	KSS
	2	Principle and working.Square wave generator using op-amp	KSS
	3	Digital display systems and Indicators-	
	4	Strain gauge and types (general description),	
May 3rd week	1	Electronic voltage regulators using ICs.	KSS
	2	Principle and working. Triangular wave generator using op-amp.	KSS
	3	Classification of displays, Light Emitting Diodes (LED)	
	4	Resistance thermometer-platinum resistance thermometer.	
May 4th week	1	Basic electrical measuring instruments Cathode ray oscilloscope	KSS
	2	Passive and active filters.	KSS
	3	Liquid Crystal Display (LCD)	
	4	Thermistor. Inductive Transducer-general principles	
June 1st	1	Block diagram, basic principle, electron beam,	KSS
	2	Fundamental theorem of filters, Proof of the theorem by considering a symmetrical T-network.	KSS
	3	LCD - Structure and working.	
	4	Linear Variable Differential Transducer (LDVT)-principle and construction,	
June 2nd week	1	CRT features, signal display.	KSS
	2	Circuitry and Cut-off frequency and frequency response of Passive (RC) (op-amp based) filters:	KSS

	3	Data Transmission systems – Advantages and disadvantages of digital transmission over analog transmission,	
	4	Capacitive Transducer, Piezo-electric transducer,	
June 3rd week	1	Basic elements of digital storage oscilloscopes	KSS
	2	Types of filters- Circuitry and Cut-off frequency	KSS
	3	Data Transmission systems – Advantages and disadvantages of digital transmission over analog transmission – Continuation	
	4	Photoelectric transducer,	
June 4th week	1	Basic DC voltmeter for measuring potential difference,	KSS
	2	Circuitry and Cut-off frequency and frequency response of Active (op-amp based) filters:	KSS
	3	Pulse amplitude modulation (PAM),	
	4	Photovoltaic cell – principle and working	
July 1st week	1	Extending Voltmeter range, AC voltmeter using rectifiers	KSS
	2	Low pass and high pass	KSS
	3	Pulse time modulation (PTM) and Pulse width modulation (PWM)-	
	4	photo diode– principle and working	
July 2nd week	1	Basic DC ammeter, requirement of a shunt, Extending of ammeter ranges.	KSS
	2	Band pass filter	KSS
	3	General principles. Principle of Phase Sensitive Detection (PSD).	
	4	Phototransistor – principle and working	
July 3rd week	1	Revision	KSS
	2	Revision	KSS
	3	Revision	
	4	Revision	
July 4th week	1	Revision and Test	KSS
	2	Revision and Test	KSS
	3	Revision and Test	
	4	Revision and Test	

: