|| Jai Sri Gurudev ||

Sri Adichunchanagiri First Grade College
Channarayapatna

DEPARTMENT OF PHYSICS

LESSON PLAN FOR THE ACADEMIC YEAR 2023-24

Programme: B.Sc. (NEP) Even-Sem

Course/Paper Name: Electricity & Magnetism

Semester: II **Total Hours:64**

Sl. No.	Topic covered	No. of Lecture Hours	Methodology /pedagogy	Date
1	**Electric charge and field**: Coulomb's law, electric field strength, electric field lines, point charge in an electric field and electric dipole, work done by a charge(derivation of the expression for potential energy)	3	Black board	1st and 2nd week
2	**Gauss's law and its applications:** (electric fields of a (i) spherical charge distribution, (ii) line charge and (iii) an infinite flat sheet of charge.	3	Black board & Lecture PPT	3rd week
3	**Electric potential:** Electric potential, line integral, gradient of a scalar function, relation between field and potential. Potential due to point charge and distribution of charges (Examples: potential associated with a spherical charge distribution, infinite line chargdistribution, infinite plane sheet of charges). Constant potential surfaces, Potential due to a dipole an electric quadrupole.	7	Black board & Lecture PPT	3rd and 4th week
4	**Conductors in electrostatic field:** Conductors in electrostatic field Conductors and insulators, conductors in electric field. Capacitance and capacitors, calculating capacitance in a parallel plate capacitor, parallel plate capacitor with dielectric, dielectrics: an atomic view. Energy stored in a capacitor, Dielectric and Guass's law	6	Black board, Lecture PPT and Group Discussion	4th to 6th Week
5	**Electric currents and current density:** Electric currents and current density. Electrical conductivity and Ohm's law. Physics of electrical conduction, conduction in metals and semiconductors,	7	Black board/ Lecture PPT	6th to 8th week

	circuits and circuit elements: Variable currents in capacitor circuits, Resistor, inductor and capacitor and their combination. force on a moving charge.			
6	**Magnetism:** Definition of magnetic field, Ampere's law and Biot-Savart law (magnetic force and magnetic flux), Magnetic force on a current carrying conductor, Hall effect. Electromagnetic induction, conducting rod moving in a magnetic field, law of induction and mutual inductance, self inductance and energy stored in a magnetic field**.**	7	Black board/Lecture PPT/Group Discussion	8^{th} to 10^{th} week
7	**Alternating current circuits:** Resonant circuit, alternating current, quality factor, RL, RC, LC, LCR circuits, admittance and impedance, power and energy in AC circuits	6	Black board, Group Discussion and Seminar	10^{th} and 11^{th} week
8	**Electromagnetic waves:** Equation of continuity, Maxwell's equations, displacement current, electromagnetic wave, energy transported byelectromagnetic waves. Electromagnetic waves in different frames of reference, Field of a current loop, magnetic moment, Electric current in atoms,electron spin and magnetic moment, magnetization and magnetic susceptibility.	8	Black board and Lecture PPT	11^{th} to 13^{th} week
9	**Types of magnetic materials:** diamagnetic, paramagnetic and ferromagnetic materials. B-H hysteresis curves.	5	Black board and Lecture PPT	13^{th} and 14^{th} week
	Practical's-Paper I	**4 hrs/week**	**Demonstration**	**1experiment/week**

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-24

B.sc Semester **Programme: B.Sc (NEP)**

Course/Paper Name: Paper – 7: PHY C14-T: Elements of Condensed Matter & Nuclear Physics

Semester: VI **Total Hours:56**

Sl. No.	Topic covered	No. of Lecture Hours	Methodology/pedagogy	Date
1	Crystal systems and X-rays: Crystal structure: Space Lattice, Lattice translational vectors, Basis of crystal structure (Definition only), Types of unit cells: primitive, non-primitive cells (Definition). Seven crystal system (Mention), Coordination numbers (Definition), Miller Indices (procedure), Expression for inter planner spacing. X Rays: Properties of X rays, production by Coolidge tube, Continuous and characteristic X-ray spectra; Moseley's law (Statement & significance). X-Ray diffraction, Bragg's law (Statement & proof). Crystal diffraction: Bragg's X-ray spectrometer (construction & working). Free electron theory of metals: Classical free electron model (Drude-Lorentz model- qualitative), expression for electrical and thermal conductivity, Weidman-Franz law, Failure of classical free electron theory; Quantum free electron theory (assumptions), Fermi level and Fermi energy (definitions only), Fermi-Dirac distribution function (expression for probability distribution F(E), statement only); expression for Fermi energy at absolute zero temperature. Density of states for free electrons (statement only, no derivation). Qualitative discussion of	12	Black board& Lecture PPT	1st and 2nd week

	lattice vibration and concept of Phonons. Specific heats of solids: classical theory (Dulong & Petit's law - limitations) Einstein's and Debye's theory of specific heats (derivations). Hall Effect in metals (statement only).			
2	Magnetic Properties of Matter: Review of basic formulae: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility, magnetization (M) (definitions only), Classification of Dia, Para, and ferro magnetic materials; Langevin Classical Theory of dia – and Paramagnetism. Curie's law (statement only), Ferromagnetism and Ferromagnetic Domains (qualitative). Discussion of B-H Curve, Hysteresis and Energy Loss, Hard and Soft magnetic materials (definition and examples) Dielectrics: Static dielectric constant, polarizability (electronic, ionic and orientation - qualitative), calculation of Lorentz field (derivation), Clausius-Mosotti equation (derivation), dielectric loss. Piezo electric effect (Defn, examples and applications). Superconductivity: Definition, Experimental results – Zero resistivity and Critical temperature– The critical magnetic field – Meissner effect, Type I and type II superconductors.	12	Black board & Lecture PPT	$2^{nd}$and 3^{rd} week
3	General Properties of Nuclei: Constituents of nucleus, Properties of nucleus (mass, radii, charge, density), binding energy, main features of binding energy versus mass number curve, angular momentum, parity, magnetic moment, electric moments (w.r.t. nucleus). Radioactivity decay: Radioactivity: definition of radioactivity, half-life (defn), mean life(defn), theory of radioactivity, equilibrium (secular & transient equilibrium). (a) Alpha decay: basics of α-decay processes, theory of α emission (brief), Gamow factor, Geiger-Nuttall law. (b) β-decay: basics of β-decay (β^- & β^+),	12	Black board & Lecture PPT	3^{rd} week

	energy kinematics for β-decay (β ray spectra), positron emission, electron capture, neutrino hypothesis. (c) Gamma decay: Gamma rays' emission & kinematics, internal conversion (Definition).			
4	Interaction of Nuclear Radiation with matter: Gamma ray interaction through matter, photoelectric effect, Compton scattering, pair production, Energy loss due to ionization (quantitative description of Bethe Block formula), energy loss of electron, introduction of Cerenkov radiation Detector for Nuclear Radiations: Gas detectors: GM Counter (Construction, working and characteristics). Basic principle of Scintillation Detectors and construction of photo-multiplier tube (PMT). Semiconductor Detectors qualitative only, Accelerators: Cyclotrons (construction, working and theory) and Synchrotrons (Principle)	12	Black board & Lecture PPT	4^{th} week
	Practical's-Paper 7	4 hrs/week	Demonstration	1experiment/week

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LESSON PLAN FOR THE ACADEMIC YEAR 2023-24

Programme: B.Sc. (NEP)

Course/Paper Name: PHY C16-T: Electronic Instrumentation & Sensors

Semester: VI **Total Hours:56**

Sl. No.	Topic covered	No. of Lecture Hours	Methodology/pedagogy	Date
1	Power supply : AC power and its characteristics, Single phase and three phase, Need for DC power supply and its characteristics, line voltage and frequency, Rectifier bridge, Filters: Capacitor and inductor filers, L-section and π-section filters, ripple factor, electronic voltage regulators, stabilization factor, voltage regulation using ICs. Basic electrical measuring instruments Cathode ray oscilloscope- Block diagram, basic principle, electron beam, CRT features, signal display. Basic elements of digital storage oscilloscopes. Basic DC voltmeter for measuring potential difference, Extending Voltmeter range, AC voltmeter using rectifiers, Basic DC ammeter, requirement of a shunt, Extending of ammeter ranges.	12	Black board& Lecture PPT	1st and 2nd week
2	Wave form generators and Filters Basic principle of standard AF signal generator: Fixed frequency and variable frequency, AF sine and square wave generator, basic Wein-bridge network and oscillator configuration, Triangular and saw tooth wave generators, circuitry and waveforms. Passive and active filters. Fundamental theorem of filters, Proof of the theorem by considering a symmetrical Tnetwork. Types of filters, Circuitry and Cut-off frequency and frequency response of Passive (RC) and	12	Black board & Lecture PPT	3nd to 7th week

	Active (op-amp based) filters: Low pass, high pass and band pass.			
3	Data Conversion and display Digital to Analog (D/A) and Analog to Digital (A/D) converters – A/D converter with pre-amplification and filtering. D/A converter - Variable resistor network, Ladder type (R-2R) D/A converter, Op-amp based D/A converter. Digital display systems and Indicators-Classification of displays, Light Emitting Diodes (LED) and Liquid Crystal Display (LCD) – Structure and working. Data Transmission systems – Advantages and disadvantages of digital transmission over analog transmission, Pulse amplitude modulation (PAM), Pulse time modulation (PTM) and Pulse width modulation (PWM)- General principles. Principle of Phase Sensitive Detection (PSD	12	Black board & Lecture PPT	8th week
4	Transducers and sensors Definition and types of transducers. Basic characteristics of an electrical transducer, factors governing the selection of a transducer, Resistive transducer-potentiometer, Strain gauge and types (general description), Resistance thermometer-platinum resistance thermometer. Thermistor. Inductive Transducer-general principles, Linear Variable Differential Transducer (LDVT)- principle and construction, Capacitive Transducer, Piezo-electric transducer, Photoelectric transducer, Photovoltaic cell, photo diode and phototransistor – principle and working	12	Black board & Lecture PPT	9th to 13th week
5	Practical's-Paper 8	4 hrs/week	Demonstration	1experiment/ week