Government General Degree College, Chapra

Department of Physics (Sem-III)

Lesson Plan 2024-2025, Undergraduate Course in Physics (NEP-2020)

Semester	Tentative dates of University Exam	Name of the faculty	Course code	Allotted topic/text	Sub-topic/Lesson plan (No. Of Lecture)
Sem- III	Follow the latest notification by KU	**Dr. Shaikh Safikul Alam (SSA)**	**PHS-M-T-3** (Electricity and Magnetism)	**Electric Field and Electric Potential**	Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. **(6 Lectures)** Conservative nature of Electrostatic Field. Electrostatic Potential. Laplace's and Poisson equations. The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torqueon a dipole. **(6 Lectures)** Electrostatic energy of system of charges. Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Uniqueness theorem (statement) Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere. **(10 Lectures)**
			PHS-M-P-3 (Electricity and Magnetism)		1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances and (e) Checking electrical fuses. 2. To study the characteristics of a series(a) RC Circuit. 3. To determine an unknown Low Resistance using Potentiometer. 4. To determine an unknown Low Resistance using Carey Foster's Bridge. 5. To compare capacitances using De' Sauty's bridge. 6. Measurement of field strength B and its variation in a solenoid (determine dB/dx)
			PHS-MI-T-3 (Electricity		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, plane charged sheet, charged conductor. **(8 Lectures)**

			and Magnetism)	**Electrostatics**	Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. **(6 Lectures)** 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. **(8 Lectures)**
			PHS-MI-P-3 (Electricity and Magnetism)		01. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses. 02. Ballistic Galvanometer:(i) Measurement of charge and current sensitivity, (ii) Measurement of CDR, (iii) Determine a high resistance by Leakage Method, (iv) To determine Self Inductance of a Coil by Rayleigh's Method. 03. To compare capacitances using De'Sauty's bridge.
			PHY-SEC-T-3 (Renewable Energy & Energy Harvesting)	**Fossil fuels and Alternate Sources of energy** **Solar energy**	Fossil fuels and nuclear energy, their limitation, need of renewable energy, non-conventional energy sources. **(3 Lectures)** Solar energy, It's importance, storage of solar energy (Thermal storage and Electrical storage, Mechanical storage), solar pond (Basic idea), Principle of operation of non-convective solar pond, applications of solar pond, solar water heating, flat plate collector, solar cooker (basic idea, Design principle and Constructional details of box type solar cooker and its limitation), solar furnace, solar green-houses (basic idea, types and advantage), Solar Cell principle (No mathematical treatment), application of solar photovoltaic system, advantage and disadvantage of Photovoltaic solar energy conversion. **(6 Lectures)**
			PHY-MU-T-3 (Physics in everyday life)	**Introduction to Physics** **Mechanics and Motion** **Energy and Its Transformations**	Overview of Physics and its role in understanding the natural world. Scientific method and experimental design. Units and measurements. **(6 Lectures)** Newton's laws of motion and their applications, Projectile motion, Forces in equilibrium, Friction and its effects, Physics of transportation and motion. **(6 Lectures)** Conservation of energy, Work and power, Potential and kinetic energy, Energy transfers

					and transformations, Physics in sports and recreational activities. **(6 Lectures)**
		Sudipta Das (SD)	**PHS-M-T-3** (Electricity and Magnetism)	**Dielectric Properties of Matter**	Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector D. Relations between E, P and D. Gauss' Law in dielectrics. **(8 Lectures)**
				Magnetic Field	Magnetic force between current elements and definition of Magnetic Field B. Biot-Savart's Law and its simple applications: straight wire and circular loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital Law and its application to (1) infinite straight wire, (2) infinite planar surface current(3) Solenoid and (4) Toroid. Properties of B: curl and divergence. Vector Potential. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements. Torque on a current loop in a uniform Magnetic Field. **(9 Lectures)**
				Magnetic Properties of Matter	Magnetization vector (M). Magnetic Intensity(H). Magnetic Susceptibility and permeability. Relation between B, H, M. B-H curve and hysteresis. **(3 Lectures)**
			PHS-M-P-3 (Electricity and Magnetism)		7. To verify the Thevenin and Norton theorems. 8. To verify the Superposition, and Maximum power transfer theorems. 9. To determine self inductance of a coil by Anderson's bridge. 10. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width. 11. To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and(b) Quality factor Q. 12. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer.
			PHS-MI-T-3 (Electricity and Magnetism)	**Magnetism**	Magneto statics: Biot-Savart's law and its applications- straight conductor, circularcoil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia, para, and ferromagnetic materials. **(10 Lectures)**
			PHS-MI-P-3 (Electricity and Magnetism)		04. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx) 05. To study the Characteristics of a Series RC Circuit. 06. To study a series LCR circuit LCR circuit and determine its (a) Resonant frequency, (b) Quality factor

					07. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q 08. To determine a Low Resistance by Carey Foster's Bridge. 09. To verify the Thevenin and Norton theorems
			PHY-SEC-T-3 (Renewable Energy & Energy Harvesting)	**Wind Energy harvesting** **Ocean Energy** **Geothermal Energy**	Fundamentals of Wind energy, Basic principle of wind energy conversion, power of wind, Forces on the blades and thrust on turbine, Basic components of a Wind energy Conversion system, Advantage and disadvantage of Wind energy Conversion system **(4 Lectures)** Ocean thermal energy conversion(OTEC) (basic idea), Open cycle OTEC system, Closed cycle OTEC system, Basic idea of Heat exchanger, Basic principle of tidal power, Basic idea about components of tidal power plant, Estimate of power in simple Single basin tidal system. **(3 Lectures)** Geothermal energy (Basic idea), Geothermal sources, Hydrothermal resources (basic idea of vapour dominated system and liquid dominated system), applications of geothermal energy, advantages and disadvantages of geothermal energy. **(3 Lectures)**
			PHY-MU-T-3 (Physics in everyday life)	**Waves and Sound** **Light and Optics**	Properties of waves, Sound waves and their characteristics, Pitch, loudness, and the Doppler effect, Sound production and perception, Physics of music and musical instruments. **(6 Lectures)** Electromagnetic spectrum, Reflection, refraction, and diffraction, Lenses and optical instruments, Vision and the human eye. **(6 Lectures)**
		Dr. Supriya Mandal (SM)	**PHY-M-T-1** (MATHEMATICAL PHYSICS-I)	**Electromagnetic Induction** **Transients** **Electrical Circuits** **Network theorems**	Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field. **(5 Lectures)** Growth and decay of currents and voltages in L-R, C-R and L-C-R circuits; electrical oscillations in L-C circuits. **(2 Lectures)** AC Circuits: Kirchhoff s laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit. **(4 Lectures)** Ideal Constant-voltage and Constant-current Sources. Network Theorems: The venin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to de circuits. **(4 Lectures)** Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping. CDR.

				Ballistic Galvanometer	**(3 Lectures)**
			PHS-M-P-3 (Electricity and Magnetism)		13. Determine a high resistance by leakage method using Ballistic Galvanometer. 14. To determine self-inductance of a coil by Rayleigh's method. 15. To determine the mutual inductance of two coils by Absolute method. 16. To study the characteristics of a series LR Circuit. 17. Measurement of the resistance of a mirror galvanometer by the half deflection method and to determine its figure of merit.
			PHS-MI-T-3 (Electricity and Magnetism)	**Electromagnetic Induction** **Maxwell's equations and Electromagnetic wave propagation**	Faraday's Law of electromagnetic induction. Lenz's Law. Self Inductance and Mutual Inductance. Inductance of single coil, Mutual Inductance of two coils. Energy stored in magnetic field. **(6 Lectures)** Equation of continuity of current, Displacement current, Maxwell's equations, Pointing vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization. **(7 Lectures)**
			PHS-MI-P-3 (Electricity and Magnetism)		10. To verify the Superposition, and Maximum Power Transfer Theorems 11. Verification of Ohm's law with a tangent galvanometer. 12. Determination of the end corrections of a metre bridge and to measure the value of an unknown resistance incorporating end corrections.
			PHY-SEC-T-3 (Renewable Energy & Energy Harvesting)	**Hydro Energy** **Piezoelectric Energy harvesting** **Electromagnetic Energy Harvesting**	Hydropower resources, Types of hydroelectric project (Run-of-river schemes, Storage schemes, Pumped-Storage schemes, Low head power plant, Medium head power plant, High head power station), environmental impact of hydro power sources. **(4 Lectures)** Introduction, Physics and characteristics of piezoelectric effect (No mathematical treatment), materials used for piezoelectricity, recent application of piezoelectric generators. **(5 Lectures)** Linear generators (principle of linear generator, applications) **(2 Lectures)**
			PHY-MU-T-3 (Physics in everyday life)	**Electricity and Magnetism** **Modern Physics**	Electric charge and electric fields, Electric circuits and Ohm's law, Magnetism and magnetic fields, Electromagnetic induction. **(6 Lectures)** Atomic structure and quantum theory, Particle physics and the Standard Model. Nuclear physics and radioactivity, Applications of modern physics in technology. **(9 Lectures)**