Government General Degree College, Chapra

Department of Physics (Sem-VI)

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

Semester	University Exam	Name of the faculty	Course code	Allotted topic/text	Sub-topic/Lesson plan (No. Of Lecture)
Sem-VI	Follow the latest notification by KU	**Dr. Supriya Mandal (SM)**	**DSE-T-02** (Solid State Physics)	**Crystal Structure**	**Solids**: Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis - Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals. Bragg's Law. Atomic and Geometrical Factor. **(12 Lectures)**
				Elementary Lattice Dynamics	Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids. T3 law **(10 Lectures)**
			SEC-T-04 (Basic Instrumentation Skills)	**Basic of Measurement**	Instruments accuracy, precision, sensitivity, resolution range etc. Errors in measurements and loading effects. **Multimeter**: Principles of measurement of dc voltage and dc current, ac voltage, ac current and resistance. Specifications of a multimeter and their significance. **(4 Lectures)**
				Electronic Voltmeter	Advantage over conventional multimeter for voltage measurement with respect to input impedance and sensitivity. Principles of voltage, measurement (block diagram only). Specifications of an electronic Voltmeter/ Multimeter and their significance. AC **millivoltmeter**: Type of AC millivoltmeters: Amplifier- rectifier, and rectifier- amplifier. Block diagram ac millivoltmeter, specifications and their significance. **(4 Lectures)**
			DSE-P-02 (Solid State Physics)	**Practical**	1. Measurement of susceptibility of paramagnetic solution (Quinckf s Tube Method) 2. To measure the Magnetic susceptibility of Solids. 3. To determine the Coupling Coefficient of a Piezoelectric crystal. 4. To measure the Dielectric Constant of a dielectric Materials with frequency **(20 Lectures)**

		Subhendu Das (SD)	**DSE-T-02** (Solid State Physics)	**Magnetic Properties of Matter** **ielectric Properties of Materials** **Ferroelectric Properties of Materials**	Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia- and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss. **(8 Lectures)** Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons, TO modes. **(8 Lectures)** Structural phase transition, Classification of crystals, Piezoelectric effect, Pyroelectric effect, Ferroelectric effect, Electrostrictive effect, Curie-Weiss Law, Ferroelectric domains, PE hysteresis loop. **(6 lectures)**
			SEC-T-04 (Basic Instrumentation Skills)	**Cathode Ray Oscilloscope**	Block diagram of basic CRO. Construction of CRT, Electron gun, electrostatic focusing and acceleration (Explanation only- no mathematical treatment), brief discussion on screen phosphor, visual persistence & chemical composition. Time base operation, synchronization. Front panel controls. Specifications of a CRO and their significance. **(6 Lectures)** Use of CRO for the measurement of voltage (dc and ac frequency, time period. Special features of dual trace, introduction to digital oscilloscope, probes. Digital storage Oscilloscope: Block diagram and principle of working. **(3 Lectures)**
			DSE-P-02 (Solid State Physics)	**Practical**	5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR) 6. To determine the refractive index of a dielectric layer using SPR 7. To study the PE Hysteresis loop of a Ferroelectric Crystal. 8. To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis. **(20 Lectures)**
		Dr. Shaikh Safikul Alam (SSA)	**DSE-T-02** (Solid State Physics)	**Elementary band theory** **Superconductivity**	Kronig Penny model. Band Gap. Conductor, Semiconductor (P and N type) and insulator. Conductivity of Semiconductor, mobility, Hall Effect. Measurement of conductivity (04 probe method) & Hall coefficient. **(10 Lectures)** Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect. Idea of BCS theory (No derivation) **(6 Lectures)**
				Signal Generators	Block diagram, explanation and specifications of low frequency signal generators. pulse generator, and function generator. Brief idea for testing, specifications. Distortion factor

			SEC-T-04 (Basic Instrumentation Skills)	**and Analysis Instruments** **Impedance Bridges & Q-Meters** **Digital Instruments** **Digital Multimeter**	meter, wave analysis. **(4 Lectures)** Block diagram of bridge. working principles of basic (balancing type) RLC bridge. Specifications of RLC bridge. Block diagram & working principles of a Q- Meter. Digital LCR bridges. **(3 Lectures)** Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter. **(3 Lectures)** Block diagram and working of a digital multimeter. Working principle of time interval, frequency and period measurement using universal counter/ frequency counter, time- base stability, accuracy and resolution**. (3 Lectures)**
			DSE-P-02 (Solid State Physics)	**Practical**	9. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 °C) and to determine its band gap. 10. To determine the Hall coefficient of a semiconductor sample. 11. To measure the mutual inductance of two coaxial coils at various relative orientations using a ballistic galvanometer. 12. Verification of the inverse cube law for magnetic dipoles (study of the dependence of the field of a magnetic dipole on distance) and determination of the horizontal component of the earth's magnetic field by deflection and oscillation magnetometers. **(20 Lectures)**