

## **SNU Chennai Entrance Examination 2023 (SNUCEE 2023)**

### **Physics Syllabus**

#### **1. Measurements, Laws of motion, Work, Energy and Power**

Measurement of basic quantities –mass, length, time, measurement accuracies, measurement errors, error propagation

Law of conservation of linear momentum and its applications. static and kinetic friction - laws of friction, rolling friction, lubrication.

Work done by a constant force and a variable force; kinetic energy. work-energy theorem, power, conservation of kinetic and potential energies, non-conservative forces, elastic and inelastic collisions in one and two dimensions.

#### **2. Properties of Matter**

Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity, Poisson's ratio, elastic energy. Viscosity - Stokes' law. terminal velocity, streamline and turbulent flow - critical velocity. Bernoulli's theorem and its applications.

Heat - temperature, thermal expansion, thermal expansion of solids, specific heat capacity:  $C_p$ ,  $C_v$ , latent heat capacity.

#### **3. Electrostatics:**

Charges and their conservation; Coulomb's law, forces between two point electric charges, forces between multiple electric charges-superposition principle, Electric field – electric field due to a point charge, electric field lines, electric dipole, electric field intensity due to a dipole, behaviour of a dipole in a uniform electric field, Electric potential - potential difference, electric potential due to a point charge and dipole, equipotential surfaces, electrical potential energy of a system of two point charges. Electric Flux-Gauss's theorem and its applications, electrostatic induction-capacitor and capacitance, dielectric and electric polarization, parallel plate capacitor with and without dielectric medium, applications of capacitor, energy stored in a capacitor, capacitors in series and in parallel.

#### **4. Current Electricity:**

Electric Current, flow of charges in a metallic conductor – drift velocity and mobility and their relation with electric current, Ohm's law, electrical resistance - V-I characteristics. electrical resistivity and conductivity-classification of materials in terms of conductivity, Carbon resistors – colour code for carbon

resistors - combination of resistors, series and parallel, temperature dependence of resistance – internal resistance of a cell, potential difference and emf of a cell, combinations of cells in series and in parallel.

Kirchoff's laws, Wheatstone's Bridge and its application for temperature coefficient of resistance measurement, Metre bridge - special case of Wheatstone bridge, Potentiometer principle - comparing the emf of two cells, internal resistance of cell

### **5. Magnetism and Magnetic Effects of Current:**

Magnetic properties – permeability, susceptibility, Classification of magnetic materials – dia, para and ferro magnetic materials, Concept of Hysteresis, Bar magnets, basic properties – magnetic dipole magnetic induction, potential energy of magnet in uniform field, Earth's magnetic field and magnetic elements

Magnetic effects of electric current – Biot Savart's law – Magnetic field due to current through circular loop, magnetic field due to infinitely long conductor, tangent law, tangent galvanometer deflection magnetometer Ampere's circuital law and its application. Force on a moving charge in uniform magnetic field and electric field cyclotron, Force on current carrying conductor in a uniform magnetic field, Forces between two parallel current carrying conductors, torque experienced by a current loop in a uniform magnetic field moving coil galvanometer, conversion of a galvanometer into voltmeter and ammeter, magnetic dipole moment of a revolving electron

### **6. Electromagnetic Induction and Alternating Current:**

Electromagnetic induction - Faraday's law - induced emf and current - Lenz's law, Eddy currents, selfinduction and mutual induction, electromotive force -methods of inducing emf, applications -AC generator - commercial generator. (Single phase, three phase). - transformer

Alternating currents-peak and RMS values, phasors and phase relationships in AC circuits - AC circuit with resistance, AC circuit with inductor, AC circuit with capacitor - LCR series circuit, resonance, power in AC circuits, wattless current

### **7. Optics:**

Reflection of light, spherical mirrors, mirror formula. refraction of light, total internal reflection and its applications, optical fibers, refraction at spherical surfaces, lenses, thin lens formula, lens maker's formula, magnification and power of a lens, combination of thin lenses in contact, combination of a lens and a mirror. Refraction and dispersion of light through a prism.

Wave front and Huygens's principle - Reflection, total internal reflection and refraction of plane wave at a plane surface using wave fronts. Interference - Young's double slit experiment and expression for fringe width - coherent source - interference of light - Formation of colours in thin films - Newton's rings. Diffraction - differences between interference and diffraction of light- diffraction grating.

### **8. Electromagnetic Waves and Dual Nature of Radiation and Matter:**

Displacement current. Maxwell's correction to Ampere's circuital law, Maxwell's equation in integral form, sources of electromagnetic waves, electromagnetic spectrum, production and properties of electromagnetic waves – Hertz's experiment, Lenard's observations, Photoelectric effect - Einstein's photoelectric equation - laws of photoelectric emission, particle nature of light, Matter waves-wave nature of particles - de-Broglie relation

### **9. Atomic and Nuclear Physics:**

Alpha-particle scattering experiment - Rutherford's model of atom - Bohr model - hydrogen spectrum.

Composition and size of nucleus-, mass defect, binding energy per nucleon and its variation with mass number, Radioactivity, alpha, beta and gamma decay and their properties; radioactive decay law, nuclear reactions-nuclear fission, nuclear reactors and fusion –hydrogen bomb –cosmic rays.

### **10. Semiconductor Electronics:**

Energy bands in solids: classification into metals, semiconductors and insulators, intrinsic and extrinsic semiconductors, formation of PN junction, Diode V-I characteristics, diode applications as rectifier, voltage regulators, LED, solar cells –Junction transistor, characteristics –application as switch, amplifier, oscillator. Logic gates -NOT, OR, AND, EXOR, NAND and NOR - De Morgan's theorem - Laws and theorems of Boolean algebra.

### **11. Communication Systems:**

Basic elements of communication system -Need for modulation and its types - Propagation of electromagnetic waves through space - Satellite communication - Fiber optic communication - RADAR Internet - Global positioning system.