

CLASS XII (2023-24)
PHYSICS (THEORY)
Syllabus & MLL (In Bold)

		No. of Periods	Marks
Unit-I	Electrostatics	26	16
	Chapter-1: Electric Charges and Fields		
	Chapter-2: Electrostatic Potential and Capacitance		
Unit-II	Current Electricity	18	
	Chapter-3: Current Electricity		
Unit-III	Magnetic Effects of Current and Magnetism	25	17
	Chapter-4: Moving Charges and Magnetism		
	Chapter-5: Magnetism and Matter		
Unit-IV	Electromagnetic Induction and Alternating Currents	24	
	Chapter-6: Electromagnetic Induction		
	Chapter-7: Alternating Current		
Unit-V	Electromagnetic Waves	04	
	Chapter-8: Electromagnetic Waves		
Unit-VI	Optics	30	18
	Chapter-9: Ray Optics and Optical Instruments		
	Chapter-10: Wave Optics		
Unit-VII	Dual Nature of Radiation and Matter	8	12
	Chapter-11: Dual Nature of Radiation and Matter		
Unit-VIII	Atoms and Nuclei	15	
	Chapter-12: Atoms		
	Chapter-13: Nuclei		
Unit-IX	Electronic Devices	10	7
	Chapter-14: Semiconductor Electronics: Materials, Devices and Simple Circuits		
Total		160	70

Unit I: Electrostatics

Chapter–1: Electric Charges and Fields

Electric charges, Conservation of charge, Coulomb's law-force between two-point charges, forces between multiple charges; **superposition principle** and continuous charge distribution.

Electric field, electric field due to a point charge, **electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in uniform electric field.**

Electric flux, statement of **Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).**

Chapter–2: Electrostatic Potential and Capacitance

Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges; **equipotential surfaces, electrical potential energy of a system of two-point charges and of electric dipole in an electrostatic field.**

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, **combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor** (no derivation, formulae only).

Unit II: Current Electricity

Chapter–3: Current Electricity

Electric current, flow of electric charges in a metallic conductor, **drift velocity, mobility and their relation with electric current;** Ohm's law, V-I characteristics (linear and non-linear), **electrical energy and power, electrical resistivity and conductivity, temperature dependence of resistance,** Internal resistance of a cell, **potential difference and emf of a cell, combination of cells in series and in parallel, Kirchhoff's rules, Wheatstone bridge.**

Unit III: Magnetic Effects of Current and Magnetism

Chapter–4: Moving Charges and Magnetism

Concept of magnetic field, Oersted's experiment.

Biot - Savart law and its application to current carrying circular loop.

Ampere's law and its applications to infinitely long straight wire.

Straight solenoid (only qualitative treatment), force on a moving charge in uniform magnetic and electric fields.

Force on a current-carrying conductor in a uniform magnetic field, force between two parallel current-carrying conductors-definition of ampere, torque experienced by a current loop in uniform magnetic field; Current loop as a magnetic dipole and its magnetic dipole moment, moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter.

Chapter–5: Magnetism and Matter

Bar magnet, bar magnet as an equivalent solenoid (qualitative treatment only), **magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis (qualitative treatment only), torque on a magnetic dipole (bar magnet) in a uniform magnetic field (qualitative treatment only), magnetic field lines.**

Magnetic properties of materials- **Para-, dia- and ferro - magnetic substances with examples**, Magnetization of materials, **effect of temperature on magnetic properties.**

Unit IV: Electromagnetic Induction and Alternating Currents

Chapter–6: Electromagnetic Induction

Electromagnetic induction; **Faraday's laws**, induced EMF and current; **Lenz's Law, Self and mutual induction.**

Chapter–7: Alternating Current

Alternating currents, **peak and RMS value** of alternating current/voltage; reactance and **impedance**; **LCR series circuit** (phasors only), resonance, **power in AC circuits, power factor, wattless current.**

AC generator, Transformer.

Unit V: Electromagnetic Waves

Chapter–8: Electromagnetic Waves

Basic idea of displacement current, Electromagnetic waves, their characteristics, their transverse nature (qualitative idea only).

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

Unit VI: Optics

Chapter–9: Ray Optics and Optical Instruments

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

Optical instruments: Microscopes and astronomical telescopes (reflecting and refracting) and their **magnifying powers.**

Chapter–10: Wave Optics

Wave optics: Wave front and **Huygen's principle**, reflection and refraction of plane wave at a plane surface using wave fronts. **Proof of laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width** (No derivation final expression only), **coherent sources** and sustained interference of light, **diffraction due to a single slit, width of central maxima** (qualitative treatment only).

Unit VII: Dual Nature of Radiation and Matter

Chapter–11: Dual Nature of Radiation and Matter

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light. Experimental study of photoelectric effect

Matter waves-wave nature of particles, de-Broglie relation.

Unit VII: Atoms and Nuclei

Chapter–12: Atoms

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model of hydrogen atom, Expression for radius of nth possible orbit, velocity and energy of electron in nth orbit, hydrogen line spectra (qualitative treatment only).

Chapter–13: Nuclei

Composition and size of nucleus, nuclear force

Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number; nuclear fission, nuclear fusion.

Unit VII: Electronic Devices

Chapter–14: Semiconductor Electronics: Materials, Devices and Simple Circuits

Energy bands in conductors, semiconductors and insulators (qualitative ideas only) Intrinsic and extrinsic semiconductors- p and n type, p-n junction

Semiconductor diode - I-V characteristics in forward and reverse bias, application of junction diode -diode as a rectifier.