PHYSICS SYLLABUS
CLASS XI (Theory) - 2021-22

Unit I: Physical World and Measurement	
Chapter 1 **Physical World**	• Physics - scope and excitement; nature of physical laws; Physics, technology and society
Chapter 2 **Units and Measurements**	• Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures • Dimensions of physical quantities, dimensional analysis and its applications
Unit II: Kinematics	
Chapter 3 **Motion in a Straight Line**	• Frame of reference, Motion in a straight line: Position-time graph, speed and velocity • Elementary concepts of differentiation and integration for describing motion. • Uniform and non-uniform motion, average speed and instantaneous velocity. Uniformly accelerated motion, velocity time and position-time graphs • Relations for uniformly accelerated motion (graphical treatment)
Chapter 4 **Motion in a Plane**	• Scalar and vector quantities; Position and displacement vectors, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative Velocity, Unit vector; Resolution of a vector in a plane - rectangular components. Scalar and vector product of vectors • Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.
Unit III: Laws of Motion	
Chapter 5 **Laws of Motion**	• Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion • Law of conservation of linear momentum and its applications • Equilibrium of concurrent forces. Static and kinetic friction, laws of friction, rolling friction, lubrication • Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on a level circular road, vehicle on banked road)
Unit IV: Work, Energy and Power	
Chapter 6 **Work, Energy and Power**	• Work done by a constant force and a variable force; kinetic energy, work-energy theorem, power • Notion of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-conservative forces: motion in a vertical circle, elastic and inelastic collisions in one and two dimensions

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Unit V: Motion of System of Particles and Rigid Body

Chapter 7 System of Particles and Rotational Motion	• Centre of mass of a two-particle system, momentum conservation and centre of mass motion
	• Centre of mass of a rigid body; centre of mass of a uniform rod
	• Moment of a force, torque, angular momentum, laws of conservation of angular momentum and its applications
	• Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.
	• Moment of inertia, radius of gyration. Values of moments of inertia, for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications

Unit VI: Gravitation

Chapter 8: Gravitation	• Kepler's laws of planetary motion. The universal law of gravitation
	• Acceleration due to gravity and its variation with altitude and depth
	• Gravitational potential energy and gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites

Unit VII: Properties of Bulk Matter

Chapter 9: Mechanical Properties of Solids	• Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus of rigidity, Poisson's ratio; elastic energy
Chapter 10: Mechanical Properties of Fluids	• Pressure due to a fluid column; Pascal's law and its applications. (Hydraulic lift and hydraulic brakes), Effect of gravity on fluid pressure
	• Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity. Bernoulli's theorem and its applications.
	• Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.
Chapter 11: Thermal Properties of Matter	• Heat, temperature, thermal expansion; thermal expansion of solids, liquids and gases, anomalous expansion of water; specific heat capacity; Cp, Cv - calorimetry; change of state -latent heat capacity.
	• Heat transfer-conduction, convection and radiation, thermal conductivity, Qualitative ideas of Blackbody radiation, Wein's displacement Law, Stefan's law, Green house effect

Unit VIII: Thermodynamics

Chapter 12: Thermodynamics	• Thermal equilibrium and definition of temperature (zeroth law of thermodynamics). Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic processes
	• Second law of thermodynamics: reversible and irreversible processes. Heat engine and refrigerator

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Unit IX: Behaviour of Perfect Gases and Kinetic Theory of Gases	
Chapter 13 **Kinetic Theory**	• Equation of state of a perfect gas, work done in compressing a gas Kinetic theory of gases - assumptions, concept of pressure. Kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, law of equi-partition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number
Unit X: Oscillations and Waves	
Chapter 14 **Oscillations**	• Periodic motion - time period, frequency, displacement as a function of time. Periodic functions • Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a loaded spring-restoring force and force constant; energy in S.H.M. Kinetic and potential energies; simple pendulum derivation of expression for its time period • Free, forced and damped oscillations (qualitative ideas only), resonance
Chapter 15 **Waves**	• Wave motion. Transverse and longitudinal waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect

PHYSICS SYLLABUS CLASS XII - 2022-23	
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 polarisation, 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).

PHYSICS SYLLABUS CLASS XII - 2022-23	
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 laws, 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, wattless current • AC generator and transformer.
Unit V: Electromagnetic waves	
Chapter 8 **Electromagnetic Waves**	• Basic idea of displacement current. Electromagnetic waves and their characteristics Transverse nature of electromagnetic waves. (Qualitative ideas only) • Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses

PHYSICS SYLLABUS CLASS XII - 2022-23	
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, lensmaker'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 maximum, (qualitative treatment only).
Unit VII: Dual Nature of Matter and Radiation	
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 VIII: Atoms & 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 this 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 IX: Electronic Devices	
Chapter 14: Semiconductor Electronics: Materials, Devices and Simple Circuits	• Energy bands in solids conductors, insulator and semiconductors; (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