CONTENTS AND SCOPE OF PHYSICS SYLLABUS

For Class XI

CONTENT	SCOPE
1. Measurements (13 periods)	
What is Physics?	Introduction to Physics (Brief account only)
Physical quantities and SI units	All physical quantities understood as consisting of a numerical magnitude and units. Base units: mass, length, time, current, temperature, luminous intensity and amount of substance in terms of number of particles, supplementary units (radian and steradian), other units, use of standard form/scientific notation and prefixes. Use of conventions for indicating units as set out in the S.I units.
Error and uncertainties	Error and uncertainties, systematic and random errors, significant figures, distinction between precision and accuracy, assessment of uncertainty in a derived quantity. Note:- Quoting answers with correct scientific notation, number of significant figures and units in all numerical and practical work be made compulsory.
Dimensions of physical quantities	Use of dimensions and units to check homogeneity of physical equations and to derive possible formulae in simple cases.
2. Vectors and Equilibrium (13 periods)	
Vectors	Rectangular co-ordinate system. Vectors: Scalars: Magnitude of vector equal vectors negative of vector Unit vector, null vector, position vector. Rule of vector addition by rectangular components. The scalar product of two vectors and its characteristics. The vector product of two vectors and its characteristics.
Equilibrium	Equilibrium of forces. Torque and equilibrium of torques.
3. Motion and Force (10 periods)	
Displacement	Definition and illustration with diagram.
Velocity	Definition and illustration of velocity, average velocity and instantaneous velocity.
Acceleration	Definition and illustration of acceleration, average acceleration and instantaneous acceleration. Velocity-time graph for constant direction, significance of area under velocity-time graph.

Equations of motion	Summarized review of equation of uniformly accelerated motion.
Force, momentum and impulse	Summarized review of Newton's laws of motion. Newton's 2nd law of motion in terms of momentum. Impulse. Law of conservation of momentum. Elastic collisions in one dimension with special cases. Force due to water flow, momentum and explosive forces. Rocket propulsion (simple treatment)
Projectile	Projectile motion in non-resistive medium. Derivation of time of flight, maximum height and horizontal range. Application to ballistic missiles.
4. Work, Power and Energy (11 periods)	
Work done by a constant force	Work as a scalar product of force and displacement. Work done in gravitational field near earth's surface.
Work done by a variable force	Work as area under force displacement graph.
Power	Power as a scalar product of force and velocity, units, examples from every day life.
Energy	Brief account of kinetic Energy and Potential Energy. Work-energy principle. Derivation of expression for absolute potential energy. Escape velocity.
Interconversion of Potential and Kinetic energies	Interconversion of Potential and Kinetic energies in a resistive medium.
Conservation of energy	Conservation of energy with examples from everyday life.
Non conventional Energy Sources	Energy from the tides, energy from waves, solar energy, solar power and intensity at earth's surface, energy from Biomass, energy from waste products, geo-thermal including aquifers and geysers (descriptive introduction)
5. Circular Motion (11 periods)	
Angular motion	Angular displacement, radian, the relationship $s = r\theta$, angular velocity, angular acceleration, relation between linear velocity and angular velocity. Equations of angular motion.
Centripetal acceleration and force	Derivation and use of $a_c = r\omega^2 = \frac{v^2}{r}$, $F_c = mr\omega^2 = \frac{mv^2}{r}$
Angular momentum	Definition of angular momentum as an analogue of linear motion. Conservation of angular momentum with examples.

Moment of Inertia	Descriptive treatment as I = $\sum_{i=1}^{n} m_i r_i^2$ Moment of Inertia of various bodies (rod, disc, sphere, and hoop), no derivation.
Rotational Kinetic energy	Rotational Kinetic energy of a disc and of a hoop on an inclined plane.
Artificial satellites. Orbital Speed	Simple introduction, weightlessness in satellites, gravity free system. (Descriptive only), artificial gravity, orbital velocity, geo-stationary orbits, communication satellites and their applications. Simple description of Einstein's view of gravitation.
6. Fluid Dynamics (10 periods)	
Fluid friction	Viscous drag. Stokes' law and terminal velocity and its derivation.
Fluid flow	Turbulent and stream line flow of fluids. Equation of continuity. Bernoulli's equation and its applications including blood flow.
7. Oscillations (14 periods)	
Simple Harmonic motion	Experimental, analytical, graphical treatments and simple examples of motion of projection of circular motion on its diameter, derivation of a $= -\omega^2$ x. Mass attached to a spring. Simple pendulum. Amplitude, period, frequency, phase recognition and use of a $= -\omega^2$ x. Knowledge and use of solutions in the form of $x = x_o \cos \omega t$ or $y = y_o \sin \omega t$
Energy conservation in S.H.M	Conservation of kinetic energy and potential energy in S.H.M.
Free and forced oscillations	Free and forced oscillations treated qualitatively, frequency response, sharpness of resonance treated qualitatively, application of damped oscillations, damping in car suspension system.
8. Waves (14 periods)	
Propagation of waves	Review of generation and propagation of waves. Nature of motions in transverse and longitudinal progressive waves, wave length, frequency and velocity of wave, Derivation of $v = f\lambda$
Speed of sound in air	Newton's formula, Laplace correction, effect of pressure, density and temperature on speed of sound in

	air. Derivation of $V = V_0 + 0.61t$.
Superposition of waves	Interference and beats. Illustration of these phenomena with the help of sound waves.
Stationary waves	Reflection of waves, a graphical and experimental approach is sufficient, stationary waves in strings. Location of nodes and anti-nodes. Vibrating air columns.
Modes of vibration of strings.	Modes of vibration of strings and use of L= nλ /2.
Doppler's effect	Doppler's effect. Proof of the relationship between apparent frequency and original frequency for the relative motion between the source and observer on the same straight line in the case of sound. Applications in radar. Sonar, astronomy, satellites and radar speed.
9. Physical Optics (17 periods)	
Interference	Concept of wavefronts. Huygen's principle. Interference. Young's double slit experiment. Conditions for detectable interference. Calculation of wave length from fringe spacing. Colour patterns in thin films. Newton's rings. Michelson interferometer and its uses.
Diffraction	Simple phenomenon and their qualitative explanation. Single slit diffraction. Diffraction grating, derivation of angular position of first minimum. Derivation and use of d sin Θ = nλ (plane grating normal incidence). Diffraction of X-rays through crystals and its uses, Bragg's equation.
Polarization	Polarization as a phenomenon associated with transverse waves. Polarization produced by Polaroids. Qualitative effect of rotation of Polaroid. Production and detection of plane polarized light.
10. Optical Instruments (16 periods)	
Magnifying power and resolving power of optical instruments	Least distance of distinct vision, magnifying power and resolving powers of simple microscope. Compound microscope and astronomical telescope.
Spectrometer	Description of spectrometer explaining the function of its various parts, details of mechanical adjustment not required.
Speed of light	Michelson rotating mirror method.
Optical fibre systems	Introduction of optical fibers, fibre optic principles- (i) total internal refraction. (ii) continuous refraction. Types

	of optical fibers, signal transmission, conversion to sound (descriptive treatment: only), losses of power.
11. Heat and Thermodynamics (22 periods)	
Kinetic theory of gases	Postulates of kinetic theory of gases, derivation of pressure of gas, interpretation of temperature and derivation of gas laws on the basis of kinetic theory.
First law of Thermodynamics	Internal energy, work and heat, familiarity with a variety of energy conversions in practical devices and processes. Isothermal and adiabatic processes. Molar specific heats of gas at constant pressure C_p and at constant volume C_v . Application of first law to derive $C_p - C_v = R$
Second law of Thermodynamics	Reversible and irreversible cycle. Heat engine, statement of second law of thermodynamics. Carnot Theorem, Thermodynamic Scale of temperature. Petrol Engine and Diesel engine (Simple Description).
Entropy	Explanation of entropy. Change of entropy $\Delta S = \pm \frac{\Delta Q}{T}$ Entropy and 2nd Law of Thermodynamics. Environmental crisis as an entropy crisis.