CONTENTS AND SCOPE OF PHYSICS SYLLABUS

Contents	Scope
1. Electrostatics (18 periods)	
Electric Field	Coulomb's law, example of fields of force. Fields of like and unlike charges. Field strength (intensity) Principle of inkjet printer and photostat copier.
Electric intensity	Electric intensity in a free space, and in other media. Determination of electronic charge by Millikan's method (Description and derivation of expression of electronic charge)
Electric Flux, Gauss's law and its application	Explanation of electric flux, Statement and proof of Guass's law, simple applications for the determination of electric field inside a hollow charged spherical conductor, near charged plane surface and between two oppositely charged plates.
Electric potential	Definition of electric potential in terms of work done in bringing a unit positive charge from infinity, electric field as potential gradient. Expression of potential at a point due to point charge, electron volt. Analogy between qualitative and quantitative aspects of electric and gravitational forces in the case of inverse square law.
Capacitors	Capacitance of a parallel plate capacitor, effect of dielectric on its capacitance, electric polarization of dielectric, charging and discharging of a capacitor through a resistance, RC time constant, Energy of a charged capacitor.
2. Current Electricity (15 periods)	
Steady currents	Steady currents, sources of current, effect of currents (Brief account only)
Resistance	Current voltage Ohmic relationship for metallic conductor at constant temperature. Non-Ohmic relationship between current voltage for semiconductor diode and a filament lamp.
Resistivity and conductivity	Simple explanation of resistivity, conductance and conductivity, calculation of the variation of resistance with temperature. Characteristic of the thermistor, colour code for carbon resistances.
Internal resistance	e.m.f. and p.d. description of internal resistance of sources. Its simple consequences for external circuits,

Kirchhoff's Laws	conditions for maximum power transfer. Kirchhoff's laws. Application of Ist law as conservation of charge and 2nd law as conservation of energy (application restricted to simple circuits only)
The Potential divider	Rheostat, its working and use in the potential divider circuit.
Balanced potentials	The Wheatstone bridge and its use to measure the resistance. The potentiometer and its use as the measurement and comparison of emf's.
3. Electromagnetism (16 periods)	
Current carrying conductor in a magnetic field	Derivation of expression for force F = ILB sin Θ, Tesla. Experimental study of factors governing field produced by long straight wire. Magnetic Flux Ø = $\overline{B}.\overline{A}$ Flux density. Ampere's Circuital law and its use to find magnetic flux density inside a solenoid.
Force on moving charged particle	Derivation of the expression of force on a moving charged particle in a uniform magnetic field and in an electric field. Deflection of beams of charge particles. Measurement of e/m.
Cathode Ray Oscilloscope (C.R.O)	Basic principle and use of C R O
Current carrying rectangular coil in a uniform magnetic field	Derivation of expression of torque due to couple acting on a coil.
Electric Instruments	Principle, Construction, working of galvanometer and its conversion into a voltmeter and an ammeter Description and use of Avometer/Multimeter. Analogue scales and digital displays (Brief account).
4. Electromagnetic Induction (12 periods)	
Law of electromagnetic induction	Review of electromagnetic induction. Faraday's law to determine the magnitude and Lenz's law to determine the direction of induced e.m.f.
Inductance	Self and mutual induction $\epsilon_L = - L \Delta I / \Delta t$ and $\epsilon_S = -M \Delta I_p / \Delta t$. Unit of inductance.
Energy stored in inductor	Knowledge and use of formula $E = \frac{1}{2} L I^2$
Simple A.C generator, D.C generator and D.C Motor	Motional e.m.f, Principle, construction and working of AC generator, DC generator, DC motor, back emf in motors and back motor effect in generators.

Transformer	Principle, Construction and operation of a transformer. Use of $N_s/N_p = V_s/V_p$ and $V_sI_s = V_pI_p$ or $V_s/V_p = I_p/I_s$ for an ideal transformer, eddy currents and use of laminated core, Hysterics loss and prevention.
5. Alternating Current (18 periods)	
Root mean square (r.m.s) value	Explanation of peak and r.m.s. values of current and voltage, knowledge and use of the relationship for the sinusoidal case
AC circuits	Flow of AC through resistors, capacitors and inductors treated separately. Phase lag and lead. Reactances of capacitors and inductors. Vector (phaser) diagram.
Impedance	Impedance as vector summation of resistances and reactances: quantitative treatment of resister and capacitor in series (R – C circuit)
Power in AC circuits	Knowledge and use of formulae for AC power $P = VI \cos \theta$ (power factor).
Resonant circuit	Quantitative understanding of the properties of circuits containing inductors and capacitors in series and parallel Principle of metal detectors for security checks, the choke coil.
Three phase AC supply	Descriptive treatment.
Electromagnetic waves	Electromagnetic waves (ranging from radio waves to γ rays) Production, transmission and reception of electromagnetic waves (Simple treatment) Amplitude Modulation and frequency Modulation.
6. Physics of Solids (8 periods)	
Classification of solids	Broad description and differences between crystalline, glassy amorphous and polymeric solids. Idea of lattice and unit cell.
Mechanical properties of solids	Elastic and plastic deformations in solids. Tensile and compression stress. Young's modulus. Shear modulus and bulk modulus. Elastic limit and yield strength. Determination of strain energy in the deformed material form area under force extension graph.
Electric properties of solids	Classification of conductors, semiconductors and insulators, energy bands in solids (description only).Energy gap in insulators, intrinsic and extrinsic semiconductors. Electrical conduction by electrons and holes in solids. Superconductors (description only)

Magnetic properties of solids	Description of dia, para and ferro magnetic solids, description of ferro magnets as a special case of para magnets, magnetic dipoles and domains. Curie point, hard and soft ferro magnetic substances, description of hystersis loss.
7. Electronics (10 periods)	
Semi conductor devices Operational amplifiers Digital system	Forward and reverse based characteristics of p-n junction. Half and full wave rectification, uses of specially designed p-n junctions. (Light emitting diode, Photodiode, Photo-Voltaic cell) Transistor and its operations, Current equations Ie = Ib + Ic , Ic = β Ib where β is current gain. Use of transistors as a switch and an amplifier. Introduction of operational amplifier by a black box approach, description of its characteristics, its applications as inverting and non-inverting amplifiers using virtual earth concept. Use of operational amplifier as comparator e.g. night switch or thermostat. Function of basic logic gates limited to a maximum of two inputs, combinations of AND, NOT, OR and NAND gates to form EX – OR and EX –NOR gates and their applications to logic control functions.
8. Dawn of Modern Physics (18 periods)	
Special theory of relativity Quantum theory of radiation Photo electric effect Compton's effect, pair production, pair annihilation and wave nature of particles Uncertainty principle	Inertial and non-inertial frames of reference, postulates of special theory of relativity and its results (no derivation), the NAVSTAR navigation system. Simple account of black body radiation, intensity distribution diagrams, Stephan – Boltzmann law , Planck's assumptions. The origin of quantum theory. The photon. Photo electric effect and its explanation on quantum theory Einstein's photoelectric equation, Photocell and its uses. Simple account of Compton's effect, pair production, pair annihilation. Dual nature of light , De-Broglie's hypothesis of wave nature of particles. Davission and Germer experiment electron microscope (simple working principle) Simple treatment

9. Atomic Spectra (15 periods)	
Spectrum of hydrogen, Bohr model of Hydrogen atom. Excitation and Ionization potentials	Known experimental facts of hydrogen spectrum. Bohr's postulates of atomic model of Hydrogen. Expressions for the quantized radii and energies. Explanation of hydrogen spectrum in terms of energy levels. De-Broglie's interpretation of Bohr's orbits. Excitation and ionization potentials
Uncertainty within the atom	Uncertainty regarding position of electron in the atom
X-rays	Production, properties and uses of X-rays.
Laser	Spontaneous emission, stimulated emission, metastable states, population inversion, laser principle, simple treatment of He – Ne laser. Applications of lasers.
10. Nuclear Physics (20 periods)	
The Atomic Nucleus	Qualitative understanding of Rutherford's scattering experiment. Charge and mass of a nucleus, Atomic number and relative isotopic mass, Isotopes, use of mass spectrograph to demonstrate the existence of isotopes and to measure their relative abundance.
Mass defect and Nuclear binding energy	Mass defect. Calculation of binding energy using Einstein's equation, variation of binding energy per nucleon with the mass number.
Radioactivity	Radioactivity as a random phenomenon; statistical nature of the process.
Decay law and Half life	Decay law $\Delta N \propto - N\Delta t$ and $N = N_0 e^{-\lambda t}$ half life.
Detection of Ionising radiation	Interaction of nuclear radiations with matter. Simple treatment of cloud chamber, Geiger counter and Solid state detector.
Nuclear reaction	Nuclear reaction, conservation of charge and mass number. Energy and mass conservation in simple reactions and in Radioactive decay. Nuclear fission and critical mass. Nuclear fusion reactions.
Nuclear reactors	Working principle of nuclear reactor. Mention of various types of reactors.
Medical Physics	Nuclear radiation exposure. Biological effects of radiation medical diagnostics, radiography, radiotherapy and tracer techniques.
Modern view of the building blocks of matter	Basic forces of nature. Basic idea of building locks of matter: hadrons, leptons and quarks.