REVISED SYLLABUS OF PHYSICS
Session: 2024-25
H.S. Second Year

One Paper (Theory) **Time: 3 hours** **Total Marks: 70**

Units		No. of Periods	Marks
Unit–I	**Electrostatics**	25	09
	Chapter–1: Electric Charges and Fields		
	Chapter–2: Electrostatic Potential and Capacitance		
Unit-II	**Current Electricity**	22	08
	Chapter–3: Current Electricity		
Unit-III	**Magnetic Effects of Current and Magnetism**	25	09
	Chapter–4: Moving Charges and Magnetism		
	Chapter–5: Magnetism and Matter		
Unit-IV	**Electromagnetic Induction and Alternating Currents**	20	09
	Chapter–6: Electromagnetic Induction		
	Chapter–7: Alternating Current		
Unit–V	**Electromagnetic Waves**	04	03
	Chapter–8: Electromagnetic Waves.		
Unit–VI	**Optics**	30	14
	Chapter–9: Ray Optics and Optical Instruments		
	Chapter–10: Wave Optics.		
Unit–VII	**Dual Nature of Radiation and Matter**	08	05
	Chapter–11: Dual Nature of Radiation and Matter		
Unit–VIII	**Atoms and Nuclei**	18	06
	Chapter–12: Atoms		
	Chapter–13: Nuclei		
Unit–IX	**Electronic Devices**	18	07
	Chapter–14: Semiconductor-Electronics: Materials, Devices and Simple Circuits		
	Total	170	70

Unit I: Electrostatics **25 Periods**

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 (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.

Unit II: Current Electricity 22 Periods

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, electrical resistance, combination of resistance(series and parallel) 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 and simple applications, Wheatstone bridge.

Unit III: Magnetic Effects of Current and Magnetism 25 Periods

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 solenoids (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 material.

Unit IV: Electromagnetic Induction and Alternating Currents 20Periods

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 (Phasor treatment only)resonance; power in AC circuits. ACgenerator and transformer. Power factor, Wattles current.

Unit V: Electromagnetic waves. 04 Periods

Chapter–8: Electromagnetic Waves

Basic idea of displacement current, Electromagnetic waves, their characteristics, their Transverse nature (qualitative ideas only). Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

Unit VI: Optics 30 Periods

Chapter–9: Ray Optics and Optical Instruments

Ray Optics: Reflection of light, spherical mirror and 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, 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 Radiation and Matter. 08 Periods

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: Atomsand Nuclei 18 Periods

Chapter–12: Atoms

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, Bohr’s model of hydrogen atom. Expression of radius of n^{th} orbit, velocity and energy of electron, hydrogen 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. **18 Periods**

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.

SYLLABUS FOR PHYSICS PRACTICAL

Total Marks- 30

Section-A

Every student will perform 08 experiments (4 from each section) & 8 activities (4 from each section) during the academic year.

Experiments :

1. To observe the variation of potential difference (V) across a given resistor by changing the current (I) through it. Draw I-V graph and find the value of the given resistance from the graph.
2. To find the value of a given resistance by using a metre bridge.
3. Construct a potential divider with the help of a rheostat and a battery (or cell) and use it to verify Ohm's Law.
4. Place a bar magnet in the magnetic meridian and draw the field lines with its
   (i) North-pole pointing towards the geographical north pointing.
   (ii) South pole pointing towards the geographical north on one side of the magnet and to locate the position of the neutral point.

Activities :

1. To observe deflection of a magnetic needle placed near a conductor carrying current.
2. To measure resistance, dC voltage, dC current and check continuity of a given electrical circuit using multimeter.
3. To assemble a household circuit comprising three bulbs, three on/off switches a fuse and a power source.
   or, Assemble an extension board with an indicator, a fuse, three plug points and three on/off switches.
4. To study the variation in potential drop with length of a wire for a steady current.
5. Assemble an electric circuit comprising of atleast a battery, rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also draw the correct circuit diagram.

Section-B

Experiments:

1. To find the focal length of a convex lens by plotting graphs between u and υ [Taken three readings making $u > \upsilon$ and three readings making $u < \upsilon$.]
2. To find the focal length of a concave lens using a convex lens.
3. To find the angle of minimum deviation for a given equilateral prism by plotting a graph between the angles of incidence (i) and corresponding angles of deviation (δ). Determine the refractive index of the material of the prism. [Take angles of incidence as 35^0, 40^0, 45^0, 50^0, 55^0, 60^0]
4. Measure the angles of incidence (i) and corresponding angles of refraction (r) for a glass slab by pin method. Draw sin i – sin r graph and find the refractive index of the material of the glass slab from the graph.
5. Draw the I-V characteristics graph of a p – n junction in forward bias. Find the dc forward resistance of the diode from the graph.

Activities :

1. To identify resistance from resistance colour codes and to verify the values using a multimeter.
2. To identify a diode, an LED, a transistor, a resistor, a capacitor and an IC from a mixed collection of such items using a multimeter.
3. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
4. To observe polarization of light using two polaroids.
5. Identify a concave and a convex mirror by observing the images formed by the mirrors.
6. To study the nature and size of the image formed by (i) convex lens (ii) concave mirror, using an optical bench.
7. Indentify a concave and a convex mirror by the image formed by the mirrors.

Suggested Investigatory Projects : (Students and teachers are free to design other project.)

1. To investigate whether the energy of a simple pendulum is conserved.
2. To investigate changes in the velocity of a body under the action of a constant force and determine its acceleration.
3. To compare effectiveness of different materials as insulators of heat.
4. To study various factors on which the internal resistance/emf of a cell depends.
5. To study infrared radiations emitted by different sources using photo-transistors.
6. To compare effectiveness of different materials as absorbers of sound.
7. To design an automatic traffic signal system using suitable combination of logic gates.
8. To compare the Young's modulus of elasticity of different specimens of rubber and also draw their elastic hysteresis curve.
9. To study collision of two balls in two dimensions.

Evaluation Scheme for Practical Examination :

*	One experiment from any one section	**12 marks**
*	One activity (from any one section) and one investigatory project Or Two activities (maximum one from each section)	**4+4=8 marks**
*	Practical record (experiments, activities and projects)	**6 marks**
*	Viva voce on activities, experiments and projects	**4 marks**
	Total	**30 marks**

PRACTICAL & ACTIVITIES

All experiments and activities should be cut and pasted from the relevant portions of the existing AHSEC syllabus.

Recommended Textbooks.

(English Medium)

1. Physics Part I, Textbook for Class XII, Published by NCERT
2. Physics Part II, Textbook for Class XII, Published by NCERT

(Assamese Medium)

1. Padartha Bigyan, Pratham Bhag, Published by AHSEC
2. Padartha Bigyan, Dwitiya Bhag, Published by AHSEC