PHYSICS +2 (2024-2025)

Senior secondary stage of school education is a stage of transition from general education to discipline-based focus on curriculum. The present update syllabus keeps in view the rigour and depth of disciplinary approach as well as the comprehension level of learners. Due care has also been taken that the syllabus is not heavy and is at the same time, comparable to the international standards. Salient features of the syllabus include:

- Emphasis on basic conceptual understanding of the content.
- Emphasis, on use of SI units, symbols, nomenclature of physical quantities and formulations as per international standards.
- Providing logical sequencing of the units of the subject matter and proper placement of concepts with their linkage for better learning.
- Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline and other disciplines.
- Promoting process-skills, problems-solving abilities and applications of Physics concepts.

Besides, the syllabus also attempts to:

- Strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
- Expose the learners to different processes used in Physics-related industrial and technological applications.
- Develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
- Promote problem solving abilities and creative thinking in learners.
- Develop conceptual competence in the learners and make them realize and appreciate the interface of Physics with other disciplines.

COURSE STRUCTURE (THEORY)

One Paper	**Time: 3 Hrs**	**60 Marks**
Chapter-1	Electric Charges and Fields	
Chapter-2	Electrostatic Potential and Capacitance	
Chapter-3	Current Electricity	
Chapter-4	Moving Charges and Magnetism	
Chapter-5	Magnetism and Matter	
Chapter-6	Electromagnetic Induction	
Chapter-7	Alternating Current	
Chapter-8	Electromagnetic Waves	
Chapter-9	Ray Optics and Optical Instruments	
Chapter-10	Wave Optics	
Chapter-11	Dual Nature of Radiation and Matter	
Chapter-12	Atoms	
Chapter-13	Nuclei	
Chapter-14	Semiconductor Electronics: Materials, Devices and Simple Circuits	

Detailed Syllabus

Chapter-1 : Electric Charges and Fields

Introduction, Electric Charge (only concept), conductors and insulators (only concept), basic properties of electric charge, coulomb's law, forces between multiple charges, electric field, electric field due to system of charges, physical significance of electric field, electric field lines, electric flux, electric dipole, field of an electric dipole (for points on the axis, for points on the equatorial plane), physical significance of dipole, dipole in a uniform external field (Torque), continuous charge distribution, Gauss's law, applications of Gauss's law

Chapter-2 : Electrostatic Potential and Capacitance

Introduction, Electrostatic potential, potential due to point charge, potential due to an electric dipole, potential due to a system of charges, equipotential surface, potential energy of a system of charges, potential energy in an external field, electrostatics of conductors, dielectrics and polarization, capacitors and capacitance, the parallel plate capacitor, elect of dielectric on capacitance, combination of capacitors (series and parallel), Energy stored in a capacitor (only concept).

Chapter-3: Current Electricity

Introduction, Electric current, electric current in conductors, ohm's law, drift of electrons and the origin of resistivity (mobility) limitations of ohms' law, resistivity of various resistivity (only concept), Temperature dependence of resistivity, electrical energy and Power, cells; EMF; internal resistance, cells in series and in parallel, Kirchhoff's rules, Wheatstone bridge.

Chapter-4: Moving Charges and Magnetism

Introduction, Magnetic Force (magnetic field, Lorentz force, magnetic force on a current carrying conductor), Motion in a magnetic field, Magnetic field due to a current element; biot-savart law, magnetic field on the axis of a circular current loop, ampere's circuital law, magnetic field due to the sale noid, force between tow parallel currents, torque on current loop; magnetic dipole (Torque on a rectangular current loop in uniform magnetic field circular current loop as a magnetic dipole), the moving coil galvanometer (conversion into ammeter and voltmeter).

Chapter-5: Magnetism and Matter

Introduction, The bar magnet (the magnetic field lines, bar magnet as an equivalent solenoid only concept, the dipole in a uniform magnetic field only concept), magnetism and Gauss's law, magnetization and magnetic intensity, magnetic properties of materials (diamagnetism, paramagnetic, ferromagnetism).

Chapter-6: Electromagnetic Induction

Introduction, Experiments of faraday and Henry, magnetic flux, faraday's law of electromagnetic induction, lenz's law and conservation of energy, motional electromotive force, inductance (self and mutual), ACA generator.

Chapter-7: Alternating Current

Introduction, AC voltage applied to resistor, AC voltage applied to inductor, AC voltage applied to a capacitor, representation, of AC current and voltage by rotating vectors (phasors , AC voltage applied to a series LCR circuit (phasor Diagram solution only), resonance, power in AC circuit, transformer.

Chapter-8: Electromagnetic Waves

Introduction, Displacement current, electromagnetic waves, electromagnetic spectrum (radio waves, microwaves, infrared waves, visible rays, ultraviolet rays, X-rays, gamma rays) properties and uses.

Chapter-9: Ray Optics and Optical Instruments

Introduction, Reflection of light by spherical mirrors, (sign convention, focal length, the mirror equation), refraction of light (lateral shift, apparent depth), total internal reflection, refraction at spherical surfaces and by lenses, power of lens, combination of thin lenses in contact, refraction through prism, optical instruments (the eye, the microscope, telescope)

Chapter-10: Wave Optics

Introduction, Huygen's principle, refraction and reflection of plane waves using huygen's principle (refraction of a plane wave, refraction at a rare3r medium, reflection of a plane wave by a plane surface), coherent and incoherent addition of waves, interference of light waves and young's experiment (final expression only) diffraction (only qualitative treatment, Polarization (concept only)

Chapter-11: Dual Nature of Radiation and Matter

Introduction, Electron emission, photoelectric effect, experimental study of photoelectric effect, photoelectric effect and wave theory of light, einstein's photoelectric equation (energy quantum of radiation), particle nature of light (the photon), wave nature of matter (only concept).

Chapter-12: Atoms

Introduction, Alpha-particle scattering and Rutherford's nuclear model of Atom, atomic spectra (only concept: bohr model of the hydrogen atom (expression for radius of n^{th} possible orbit only not derivation), the line spectra of hydrogen atom (only qualitative treatment), De-broglie's explanation of bohr's second postulate of quantization.

Chapter-13: Nuclei

Introduction, Atomic masses and composition of nucleus, size of nucleus, mass-energy and nuclear binding energy, nuclear force, radioactivity (only qualitative), nuclear energy (fission, fusion, controlled thermonuclear fusion).

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

Introduction, classification of metals, conductors and semiconductors (on the basis of conductivity on the basis of energy bands), intrinsic semi conductor, extrinsic semiconductor (n-type, P-type), P-N junction (formation), semiconductor dioe (as forward bias and as reverse bias) application of junction diode as rectifier (half wave and full wave).

PRACTICALS

Every student will perform 10 experiments (5 from each section) and 8 activities (4 from each section) during the academic year. Two demonstration experiments must be performed by the teacher with participation of students. The students will maintain a record of these demonstration experiments.

B. Evaluation Scheme for Practical Examination:

- One experiment from any one Section
- Two activities (One from each section)
  Practical record (experiments & activities)
- Record of demonstration experiments & Viva based on these experiments
- Viva on experiments and activities

SECTION A

EXPERIMENTS

1. To determine resistance per cm of a given wire by plotting a graph of potential difference versus current.
2. To find resistance of a given wire using meter bridge and hence determine the specific resistance of its material.
3. To verify the laws of combination (series/parallel) of resistances using a meter bridge.
4. To compare the emf of two given primary cells using potentiometer.
5. To determine the internal resistance of given primary cell using potentiometer.
6. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
7. To convert the given galvanometer (of known resistance of figure of merit) into an ammeter and voltmeter of desired range and to verify the same.
8. To find the frequency of the a.c. mains with a sonometer.

ACTIVITIES

1. To measure the resistance and impedance of an inductor with or without iron core.
2. To measure resistance, voltage (AC/DC), current (AC and check continuity of a given circuit using multimeter.
3. To assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source.
4. To assemble the components of a given electrical circuit.
5. To study the variation in potential drop with length of a wire for a steady current.
6. To draw the diagram of a given open circuit comprising at least a battery, resistor/rheostat, key, ammeter and voltmeter. Mark the components that are not connected in proper order and correct the circuit and also the circuit diagram.

SECTION B

EXPERIMENTS

1. To find the value of v for different values of u in case of, a concave mirror and to the find the focal length.
2. To find the focal length of a convex lens by plotting graphs between u and v or between I/u and 1/v.
3. To find the focal length of a convex mirror, using a convex lens.
4. To find the focal length of a concave lens, using a convex lens.
5. To determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and the angle of deviation.
6. To determine refraction index of a glass slab using a travelling microscope.
7. To find refractive index of a liquid by using (i) concave mirror, (ii) convex lens and plane mirror.
8. To draw the I-V characteristic curve of a p-n junction in forward bias and reverse bias.
9. To draw the characteristic curves of a zener diode and to determine its reverse break down voltage.
10. To study the characteristics of a common-emitter npn or pnp, transistor and to find out the values of current and voltage gains.

ACTIVITIES

1. To study effect of intensity of light (by varying distance of the source) on an L.D.R.
2. To identify a diode, an LED, a transistor, and IC, a resistor and a capacitor from mixed collection of such items.
3. **Use of multimeter to**
   - **(i)** Identify base of transistor
   - **(ii)** Distinguish between npn and pnp type transistors
   - **(iii)** See the unidirectional flow of current in case of a diode and an LED.
   - **(iv)** Check whether a given electronic components (e.g. diode, transistor or I C) is in working order.
4. To observe refraction and lateral deviation of beam of light incident obliquely o glass slab.
5. To observe polarization of light using two Polaroid.
6. To observe diffraction of light due to a thin slit.
7. To study the nature and size of the image formed by (i) convex lens (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
8. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.