TRIPURA BOARD OF SECONDARY EDUCATION

SYLLABUS

(effective from 2015)

SUBJECT : PHYSICS
(Class XII)

PHYSICS

COURSE STRUCTURE

Class XII (Theory)

One Paper **Time: 3 Hours** **Marks:70**

Unit	Title	Marks
I.	Electrostatics	08
II.	Current Electricity	07
III.	Magnetic effect of current & Magnetism	08
IV.	Electromagnetic induction & Alternating current	08
V.	Electromagnetic Waves	03
VI.	Optics	14
VII.	Dual Nature of Matter	04
VIII.	Atoms and Nuclei	06
IX.	Electronic Devices	07
X.	Communication Systems	05
	Total	**70**

UNIT I. Electrostatics (25 periods)

Electric Charges : Conservation of charge, Coulomb's law-force between two point charges, forces, 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' theorem and its application to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside).

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 a electrostatic field.

Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric palarisation, capacitors and capacitance, combination of capacitors in series in parallel, capacitance of a parallel plate capacitor with one without dielectric medium between the plates, energy stored in a capacitor. Van de Graaff generator.

UNIT II. Current Electricity (25 periods)

Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current; Ohm's law electrical resistance,

V-I Characteristics (linear and non-linear), electrical energy and power, electrical resistivity and conductivity.

Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance. Internal resistance of a cell, potentia difference and emf of a cell, combination of cells in series and in parallel. Elementary idea of secondary cells. Kirchoffs' laws and simple applications. Wheatstone bridge, metre bridge.

Potentiometer - principle and its applications to measure potential difference and for comparing emf of two cells; measurement of internal resistant of a cell.

UNIT III. Magnetic effects of current and magnetism (25 periods)

Concept of magnetic field, Oersted's experiment.

Biot - Savart law and its application to current carrying circular loop.

Ampere's law and its application to infinitely long straight wire, straight and toroidal solenoids.

Force on a moving charge in uniform magnetic and electric fields. Cyclotron. Force on a current-carrying conductor-definition of ampere. Torque experienced by a current loop in uniform magnetic field; moving coil galvanometer- its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic dipole moment. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as a equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic

elements. Para-, dia- and ferro- magnetic substances, with examples. Electromagnets and factors affecting their strengths. Permanent magnets.

UNIT IV. Electromagnetic Induction & alternating currents (20 periods)

Electromagnetic induction; Faraday's laws, inducted emf and current; Lenz's Law, Eddy currents. Self and mutual induction.

Alternating currents, peak and rms value of alternating current / voltage; reactance and impedance; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits, wattless current. AC generator and transformer.

UNIT V. Electromagnetic waves (4 periods)

Need for displacement current.

Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.

Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, gamma rays) including elementary facts about their uses.

UNIT VI. Optics (30 periods)

Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications, optical fibres, refraction at spherical surface, lenses, thin lens formula, lens-maker's formula. Newton's relation : Displacement method to find position of images (conjugate points) Magnification, power of a lens, combination of

thin-lenses in contact, combination of a lens and a mirror. Refraction and dispersion of light through a prism.

Scattering of light - blue colour of the sky and reddish appearance of the sum at sunrise and sunset. Elementary idea of Roman effect.

Optical instruments : Human eye, image formation and accommodation, correction of eye defects (myopia, hypermetropia, presbyopia and astigmatism) using lenses. Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.

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, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes. Polarisation, plane polarised light; Brewster's law, uses of plane polarised light and Polaroids.

UNIT VII. Dual Nature of Matter and Radiation (8 periods)

Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation-particle nature of light.

Matter waves-wave nature of particles, de Broglie relation. Davisson-Germer experiment (experimental details should be omitted; only conclusion should be explained).

UNIT VIII. Atoms & Nuclei (18 periods)

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Continuous and characteristic X-rays. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity alpha, beta and gamma particles/rays and their properties; radioactive decay law.

Mass-energy relation, mass defect; blinding energy per nucleon and its variation with mass number; nuclear fission and fusion.

UNIT IX. Electronic Devices (18 periods)

Energy bands in solids, conductors, insulators and semiconductors; semiconductor diode - I-IV characteristics in forward and reverse bias, diode as a rectifier, I-V Characteristics in forward and reverse bias, diode as a ractifier; I-V characteristics of LED, photodiode, solar cell and Zener diode.

Zener diode as a voltage regulator, Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.

UNIT X. Communication Systems (10 periods)

Elements of a communication system (block diagram only); bandwidth of signals (speech, TV and digital data); bandwidth of transmission medium.

Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation. Need for modulation.

Production and detection of an amplitude-modulated wave.

PRACTICALS

Every student will perform at least 12 experiments (6 from Section A & 6 from section B). The activities mentioned here should only be for the purpose of demonstration. One project of three marks is to be carried out by the students.

B. EVALUATION Scheme for Practical Examination :

-	Two experiments one from each section	8+8 marks
-	Practical record (experiments & activities)	6 marks
-	Project	3 marks
-	Viva on experiments & project	5 marks
		Total 30 marks

SECTION -A

Experiments

(Any 6 experiments out of the following to be performed by the students)

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

Activities (for the purpose of demonstration only) (Any three)

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

(Any 6 experiments out of the following to be performed by the students)

1. To find the value of v for different values of u in case of a concave mirror and to find the focal length.
2. To find the focal length of a convex mirror, using a convex lens.
3. To find the focal length of a convex lens by plotting graphs between u and v or between I/u and I/v.
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 angle of deviation.
6. To determine refractive 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 curve 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 (for the purpose of demonstration only) (Any three)

1. To identify a diode, an LED, a transistor, and IC, a resistor and a capacitor from mixed collection of such items.
2. 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 the whether a given electronic component (e.g. diode, transistor or I C) is in working order.
3. To study effect of intensity of light (by varying distance of the source) on an L.D.R.

4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
5. To observe polarization of light using two Polaroids.
6. To observe diffraction of light due to a thin slit.
7. To study that 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.

PHYSICS CLASS XII

UNITWISE QUESTION TYPES WITH MARKS DISTRIBUTION

	Title	MCQ/ Objective 1 Mark	SA-I 2 Marks	SA-II 3 marks	LA 5 marks	Total
I	Electrostatics	1	2	1	-	8
II	Current Electricity	2	1	1	-	7
III	Magnetic Effect of Current and Magnetism	1	2	1	-	8
IV	Electromagnetic Induction and Alternating Current	1	1	-	1	8
V	Electromagnetic Waves	-	-	1	-	3
VI	Optics	1	1	2	1	14
VII	Dual Nature of Radiation and Matter	-	2	-	-	4
VIII	Atoms and Nuclei	-	-	1+1=2	-	6
IX	Electronic Devices	-	1	-	1	7
X	Communication Systems	2	-	1	-	5
	Total no. of questions	3+5=8	10	9	3	
	Total	8	20	27	15	70

N.B. 1. Internal choice : There is no overall choice in the paper. However there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all the three questions of 5 marks weightage. But not more than one internal choice should be from the same unit.

2. In SA-II & LA-types, total allotted marks in each may be subdivided if, necessary.

3. Questions should be set covering each unit.