NCERT Class 12 Physics Syllabus

CLASS XII (THEORY)

(Total Periods: 160)

UNIT I: ELETROSTATICS **26 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 (field 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 (no derivation, formulae only).

UNIT II: CURRENT ELECTRICITY **18 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, 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 rules, 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 solenoid (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 materials, effect of temperature on magnetic properties.

UNIT IV: ELETROMAGNETIC INDUCTION AND ALTERNATING CURRENTS **24 Periods**

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 (phasors only), resonance, power in AC circuits, power factor, wattless current.
AC generator, Transformer.

UNIT V: ELECTROMAGNETIC WAVES **04 Periods**

Chapter 8 – Electromagnetic Waves
Basic idea of displacement current, Electromagnetic waves, their characteristics, their transverse nature (qualitative idea 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 mirrors, mirror formula, refraction of light, total internal reflection and 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 maxima (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: ATOMS AND NUCLEI **15 Periods**

Chapter 12 – Atoms
Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model of hydrogen atom, Expression for radius of nth possible orbit, velocity and energy of electron in his orbit, of hydrogen line 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: ELETRONIC DEVICES **10 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.

PRACTICALS

SECTION – A

EXPERIMENTS
1. To determine resistivity of two / three wires by plotting a graph for potential difference versus current.
2. To find resistance of a given wire / standard resistor using metre bridge.
3. To verify the laws of combination (series) of resistances using a metre bridge.

OR

To verify the laws of combination (parallel) of resistances using a metre bridge.
4. To determine resistance of a galvanometer by half-deflection method and to find its figure of merit.
5. To convert the given galvanometer (of known resistance and figure of merit) into a voltmeter of desired range and to verify the same.

OR

To convert the given galvanometer (of known resistance and figure of merit) into an ammeter of desired range and to verify the same.
6. To find the frequency of AC 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 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 1/u and 1/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 the refractive index of a liquid using convex lens and plane mirror.
8. To find the refractive index of a liquid using a concave mirror and a plane mirror.
9. To draw the I-V characteristic curve for a p-n junction diode in forward and reverse bias.

ACTIVITIES

1. To identify a diode, an LED, a resistor and a capacitor from a mixed collection of such items.
2. Use of multimeter to see the unidirectional flow of current in case of a diode and an LED and check whether a given electronic component (e.g., diode) is in working order.
3. To study effect of intensity of light (by varying distance of the source) on an LDR.
4. To observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab.
5. To observe diffraction of light due to a thin slit.
6. To study the nature and size of the image formed by a (i) convex lens, or (ii) concave mirror, on a screen by using a candle and a screen (for different distances of the candle from the lens/mirror).
7. To obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

Disclaimer
Dropped Topics/ Chapters

Chapter 1 - Electric Charges and Fields

1.2 Electric Charge (delete only activity with paper strips and making electroscope)
1.3 Conductors and Insulators (delete only concept of earthing)
1.4 Charging by Induction
Exercises 1.13, 1.25–1.34

Chapter 2 - Electrostatic Potential and Capacitance

2.15 Energy Stored in a Capacitor (delete only derivation)
Exercises 2.12 to 2.36

Chapter 3 - Current Electricity

3.7 Resistivity of Various Materials (delete Tables 3.1 and 3.2 and Carbon resistors, Colour code for carbon resistor)
3.10 Combinations of Resistors – Series and Parallel
Example 3.5
3.15 Meter Bridge
3.16 Potentiometer
Exercises 3.3, 3.4, 3.10, 3.12, 3.14–3.23

Chapter 4 - Moving Charges and Magnetism

Table 4.1
4.4.1 Velocity Selector
4.4.2 Cyclotron
4.8.2 The Toroid
4.10.3 The Magnetic Dipole Moment of a Revolving Electron
Exercises 4.14–4.28

Chapter 5 - Magnetism and Matter

5.2.2 Bar Magnet as an Equivalent Solenoid (delete only mathematical treatment)
5.2.3 The Dipole in a Uniform Magnetic Field (delete only mathematical treatment)
Example 5.4
5.4 Earth's Magnetism
5.41. Magnetic Declination and Dip
Table 5.2

5.6.2 Paramagnetism (delete only Curie's Law)
5.6.3 Ferromagnetism (delete only Curie's temperature; and Hysteresis)
5.7 Permanent Magnets and Electromagnets
Exercises 5.1, 5.2, 5.9–5.11, 5.13–5.25

Chapter 6 - Electromagnetic Induction
6.7 Energy Consideration: A Quantitative Study
6.8 Eddy Currents
Exercises 6.6, 6.10–6.17

Chapter 7 - Alternating Current
Figure 7.7 Magnetisation and Demagnetisation of an Inductor
Figure 7.10 Charging and Discharging of a Capacitor
7.6.2 Analytical Solution (of series LCR circuit)
7.6.3 Resonance (delete only Sharpness of Resonance)
7.8 LC Oscillations
Exercises 7.6, 7.8, 7.10, 7.12–7.26

Chapter 8 - Electromagnetic Waves
Example 8.1
8.3.2 Nature of Electromagnetic Waves (delete only about ether and page 277)
Example 8.4 and 8.5
Exercises 8.11–8.15

Chapter 9 - Ray Optics and Optical Instruments
9.3 Refraction (delete only advanced sunrise and delayed sunset)
9.4.1(i) Mirage
9.4.1(ii) Diamond
9.7 Some Natural Phenomena due to Sunlight
9.7.1 The Rainbow
9.7.2 Scattering of Light
Exercise 9.18

Chapter 10 - Wave Optics
10.3.4 Doppler Effect
Example 10.1
10.5 Interference of Light Waves and Young's Experiment (retain the final expressions for dark and bright fringes but delete the derivation; delete expression for fringe width)
10.6 Diffraction (retain only qualitative treatment)
10.6.3 Resolving Power of Optical Instruments
10.6.4 Validity of Ray Optics
10.7.1 Polarisation by Scattering
10.7.2 Polarisation by Reflection
Exercises 10.7–10.21

Chapter 11 - Dual Nature of Radiation and Matter
Table 11.1
Example 11.3
11.8 Wave Nature of Matter (delete only derivation for de Broglie wavelength of accelerated electron; and Heisenberg's uncertainty principle)
11.9 Davisson and Germer Experiment
Appendix 11.1 The History of Wave-Particle Flip-Flop
Exercises 11.5, 11.7, 11.12 to 11.14, 11.16, 11.17, 11.19–11.37

Chapter 12 - Atoms
12.3.1 Spectral Series
12.4 Bohr Model of the Hydrogen Atom (retain only the expression for radius of nth possible orbit but delete its derivation)
12.5 The Line Spectra of the Hydrogen Atom (retain only qualitative treatment)
Example 12.6
Exercises 12.3, 12.11–12.17

Chapter 13 - Nuclei
13.6.1 Law of Radioactive Decay
13.6.2 Alpha Decay
13.6.3 Beta Decay
13.6.4 Gamma Decay
13.7.2 Nuclear Reactor
Exercises 13.1, 13.2, 13.6–13.10, 13.12–13.14, 13.18, 13.22–13.31

Chapter 14 - Semiconductor Electronics: Material Devices and Simple Circuits
14.8 Special Purpose p-n junction Diodes
14.9 Digital Electronics and Logic Gates
Exercises 14.7–14.15