### DEPARTMENT OF PHYSICS
### M.SC SYLLABUS

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### SEMESTER I

**PHY-PG-C101: ELECTRONICS & NUMERICAL METHODS**

**Unit I: Amplifiers**
BJT & FET amplifiers, types of amplifiers, DC biasing analysis, determination of operating points, Transistor equivalent models: $h$-parameters and $r_e$ model, Power amplifiers, Transistor frequency response. Feed back in amplifiers. Oscillator (Hartley, Phase shift, Crystal oscillators), Operational amplifier: Ideal and practical properties, Virtual ground, CMRR. Op-amp as analog computer (adder, subtractor, integrator, differentiator). Applications of op-amp as: Comparator, Schmitt Trigger, Active filters.

**Unit II: Combinational logic circuit**
Boolean operation, simplification of Boolean expression, De Morgans theorem, Adder and subtractor (half and full), Multiplexer and Demultiplexer, encoder and Decoder, RTL, DTL,
TTL, ECL, CMOS families. Sequential logic circuit: Flip flops: RS, JK, Master slave, D and T. Counters, registers. RAM & ROM. Introduction to microcomputer, memory, input/output and interfacing devices, INTEL8085 CPU-Architecture, BUS timing, demultiplexing the address bus generating control signals, instruction set, addressing modes and assembly language programmes for simple mathematical operations.

Unit III: Instrumentation
Error analysis. Noise: Various types of noises, signal to noise ratio.
CRO & Recorders: General purpose oscilloscope, CRT screen characteristics, vertical & horizontal amplifiers, delay line, time base and sweep trigger circuits, synchronization, sampling oscilloscope, digital storage oscilloscope, typical measurements using CRO, Recorder: Galvanometer type recorder, XY recorders, magnetic recorders, digital data recording.

Unit IV: Numerical Methods

Texts Books:

References:
PHY-PG-C102: CLASSICAL MECHANICS

Unit I: Lagrangian & Hamiltonian Formalism
Hamilton principle-derivation of Lagrange equations. Simple applications of Lagrangian formulation, generalized momenta, cyclic coordinates, Routh's procedure, symmetry properties and conversation laws.
Hamilton equations of motion, preservation of phase volume under Hamilton flow (Liouville theorem), canonical transformations, generating functions, Poisson brackets, applications to simple problems.

Unit II: Applications
Hamilton-Jacobi equation, harmonic oscillator problem as an example, separation of variables in the Hamilton-Jacobi equation, action-angle variable, Solving Kepler’s problem by HJ method.
Central force problem, Kepler’s problem, inverse square law of forces, scattering in central force field, Rutherford formula, Virial theorem.

Unit III: Rigid Bodies
The kinematics of rigid body motion, Euler angles, infinitesimal rotations, the Coriolis force, rigid body equations of motion.

Unit IV: Small Oscillations & Chaos
Theory of small oscillations, normal modes of the system.
Non-linear equation of motions; phase diagram, simple examples like Duffing and van der Pol oscillators
Basic idea of chaotic solutions; fixed points and attractors; bifurcations; strange attractors; logistic maps, fractal dimensions and Lyapunov exponent.

Reference Books:
5. MG Calkin, Lagrangian and Hamiltonian Mechanics; World Scientific Publishing Co Pte Ltd (18 March 1999)

PHY-PG-C103: MATHEMATICAL PHYSICS & QUANTUM MECHANICS I

Unit I: Complex Analysis
Geometrical representation of complex numbers. Functions of complex variables, differentiation. Properties of analytical functions, Cauchey-Riemann conditions.
Contours and contour Integration in complex plane, Cauchy theorem, Cauchy integral Formula. Taylor and Laurent series representation, Features of singular points, poles.
Residues, Cauchy residue theorem. Applications of the residue theorem.

Unit II: Linear Algebra
Vector Spaces, linear independence, spanning set and basis, Linear operators, representations of vectors and linear operators with respect to bases and change of basis,.Inner Product space (Field of C-No.), Hermitian operators. Eigen values and eigenvectors and their determination, diagonalization of linear operators and matrices.

**Tensor Analysis**

**Unit III: Quantum Mechanics: Exactly Solvable Problems**

**One dimension:** Postulates of Quantum Mechanics. Free particle, position space and momentum space wave function, Heisenberg uncertainty relation, expectation values. Schrodinger equations, equation of continuity. Particle in a box, simple harmonic oscillator (ladder operator and wave functions), Ehrenfest theorem. classical limit.

**Three dimension:** Rotational Invariance and angular momentum, eigenstates and eigenvalues of angular momentum operators. Separation of variables, spherical harmonics. Particle in central force, free particle in spherical polar coordinate, hydrogen atom.

**Unit IV: Quantum Mechanics: Approximation Methods**

**Perturbation Theory:** Time independent perturbation theory, non-degenerate and degenerate cases, fine structure and Zeeman effect (without spin), Stark effect, Fine structure, hyperfine structure, Lamb shift.


**Approximation methods:** WKB approximation, validity of WKB approximation, alpha emission. Variational method, ground state of helium atom.

**Text Books:**


**Reference Books:**


**PHY-PG-C104: ELECTRONICS LABORATORY**

[A minimum of 10 experiments has to be performed from the following list.]

1. Shunt Voltage regulator using zener diode.
2. Diode Applications: Clipping and Clamping circuits.
3. BJT characteristics. Determination of h-parameters in the CE configuration using the measured input and output characteristics of a BJT (e.g.2N 2218)
5. Wien’s Bridge Oscillator.
6. Multivibrators – Bistable, Monostable and Free Running multivibrators using BJT’s (e.g.2N 2218).
8. Series Dissipative Voltage Regulator using 723 IC.
9. Universal Gate,
10. Adder/Subtractor
11. Multiplexer
12. BCD-to-7 segment decoder
13. J-K flip-flop
14. parallel up/down counter
15. A to D and D to A Converters

**SEMESTER II**

**PHY-PG-C201: MATHEMATICAL PHYSICS AND ELECTROMAGNETISM**

**Unit I: Integral Transforms & Special Functions**
Fourier series and applications. Fourier transforms, Laplace transforms.
Linear ordinary differential equations with constant coefficients. Fuch’s theorem, Frobenius method of series solution.
Bessel’s, Legendre’s, Hermite’s and Laguerre’s differential equations and solutions: Generating function, Rodrigue’s formula, orthogonality. recurrence Associated Legendre and Laguerre polynomials, Green’s function

**Unit II: Group Theory**
Definitions and examples of physically important finite groups. Multiplication table, Homomorphism and Isomorphism. Subgroups, Cyclic groups, Center. Classes, Cosets, Factor groups. Representation, reducible and irreducible representation, Character table. Simple applications. Lie groups, SU(2) and SU(3) groups
Unit III: Electrostatics
Electrostatics and dielectrics: Polarization and bound charge, displacement field, Clausius Mossotti formula, Poisson’s equation in a uniform linear dielectric. Boundary value problems with dielectrics.

Unit IV: Magnetostatics
Electric Current as a source of magnetic field, Equations of magnetostatics in differential and integral forms, Vector potential, magnetic dipole, multipole expansion of vector potential
Magnetic fields and matter: magnetization and bound currents, Amperes law for free currents and \( \mathbf{H} \), Boundary Conditions, magnetic scalar potential.

Text Books:
2. Mathew and Walker

Reference Books:

PHY-PG-C202: QUANTUM MECHANICS II

Unit I: Interaction with radiation and identical particle
Dipole approximation, absorption and stimulated emission, spontaneous emission, Einstein’s A and B coefficient, photoelectric effect, decay width.
**Identical Particles and Spins**: Indistinguishability, symmetric and anti-symmetric wave functions, Pauli exclusion principle, electron spin functions, the helium atom, para and ortho states. Afbau principle, Hund’s rule and periodic model, Spin angular momentum, Addition of angular momenta, Clebsch-Gordon coefficients, LS and JJ couplings.
Central field approximation, Thomas-Fermi model, Hartee-Fock method and self-consistent field.

**Unit II: Scattering Theory**

**Unit III: Relativistic Quantum Mechanics**
The Klein-Gordon equation, probability density and probability current density, solution of free particle Klein-Gordon equation in momentum representation. Dirac equation, solution of the free particle. Interpretation of negative probability density and negative energy solutions. Inadequacy of Relativistic Quantum Mechanics, requirement of Field theory.

**Unit IV: Quantisation of Fields**
Classical field theory. Lagrangian and Hamiltonian formulations. Real and Complex scalar and Dirac fields. Symmetry and conservation, Noethers theorem. Quantisations of scalar field, creation, annihilation and number operators, Fock space, momentum and Hamiltonian operator, time ordering, Green’s functions, Feynman propagator. Quantisation of Dirac field, anti commutation, propagators.

**Text Books:**
5. Bjorken and Drell, Relativistic Quantum Mechanics

**Reference Books:**
4. T-Y Wu and W-Y P. Hwang: *Relativistic Quantum Mechanics and Quantum Field*,

**PHY-PG-C204: GENERAL LABORATORY**
[A minimum of 10 experiments has to be performed from the following list]
1. Determination of velocity of ultrasonic wave by using Ultrasonic interferometer of in solid/liquid.
2. To study the Hall effect (i) to find the variation of temperature dependence of Hall coefficient (ii) to find the type of charge carriers.
3. Determination of Planck’s constant by using LED
4. Verification /determination of Stefan’s Law/Stefan’s constant.
5. Determination of resistivity and energy gap of semiconductor by Four Probe method.
7. Determination of thickness of a thin wire with laser.
10. Study of Hydrogen spectrum and determination of Rydberg’s constant.
11. Determination of Dielectric Constant (Solid & liquid).
12. To study Photoconductivity of the given sample.
13. Fresnal Diffraction
14. Fibre Optics
15. Holography

SEMESTER III
PHY-PG-C301: ELECTRODYNAMICS

Unit I: Time varying fields & Maxwells equations

Unit II: Plane electromagnetic waves
Properties of the electromagnetic wave equations in different media (vacuum, conductor, plasma and waveguides). Rectangular waveguides and resonant cavities. Reflection and refraction of electromagnetic waves at the interface of non-conducting media.

Unit III: Radiating fields

Unit IV: Waves in plasma

Text Books:

**PHY-PG-C302: STATISTICAL PHYSICS I**

**Unit I: Thermodynamic laws and functions**
Entropy, Free energy, Internal Energy, Enthalpy, Chemical Potential, Systems with large number of degrees of freedom, Micro and macro states, Phase space of a classical system, Density of states, Liouville’s Theorem.

**Unit II: Basic principles of ensembles**
Micro-canonical, Canonical and Grand canonical ensembles, Concept of ensemble average, Equation of state, specific heat and entropy of a classical ideal gas, Gibb’s paradox and its resolution, Energy and Density fluctuations, Virial and equipartition theorems, Partition function, Determination of translational, rotational and vibrational motions to the partition functions of an ideal diatomic gas.

**Unit III: Quantum Statistics**

**Unit IV: Ideal Bose & Fermi Systems**
Thermodynamics of Black body radiation, Stefan-Boltzman law, Wien's Displacement Law, Ideal Bose System: Thermodynamic behaviour of ideal Bose gas, Bose-Einstein condensation
Ising Model

**Text Books:**
Reference Books:

**PHY-PG-C304: MODERN PHYSICS AND DIGITAL ELECTRONICS LABORATORY**

1. Measurement of the energy gaps of (i) Silicon and (ii) Germanium
2. Determination of spin-spin relaxation time of a given sample and the value of the spectroscopic splitting factor (g).
3. Determination of the concentration of colour centers in an alkali halides crystal.
4. Experiment on superconductivity.
5. Experiments on dielectric constants of solid/liquid.
6. Ionization potential
7. Specific heat of graphite
8. Determination of e/m by Zeeman Effect
9. Study of Raman effect using spectrometer
10. Determination of numerical apertures and divergence of given laser
11. Laser Doppler Anemometry with Cassy
12. Emission and absorption/optical pumping
13. Doppler free spectroscopy
14. Polarisation (QW plate, Half wave plate)

**SEMESTER IV**

**PHY-PG-C401: SOLID STATE PHYSICS**

**Unit I: Symmetry of Crystals**
Bragg’s law in direct and reciprocal lattice, Laue diffraction, simple crystal structures, atomic scattering factor, neutron diffraction, electron diffraction, crystal structure determination by Laue, powder and rotating crystal methods. Concept of point groups, Influence of symmetry on physical properties, space groups, derivation of equivalent point positions, triclinic and monoclinic systems.

**Unit II: Vibrations and Defects**
Defects in Solids, Grain and twin boundaries, Point Defects, line defects and planar defects or dislocations and their effects on solid state properties, colour centres. Lattice vibrations, phonons and dispersion relations for acoustical and optical lattice vibrations in crystals (mono and diatomic linear lattice), phonons, normal and Umklapp processes, anharmonic vibrations, thermal expansions and thermal conductivity. Bloch theorem, Brillouin zones for simple lattices, crystal momentum, effective mass of electrons and holes, application to simple cubic lattices, ideas of Fermi surfaces, band structure of simple elements.
Unit III: Electric polarization and Band Structure
Electric polarization, Static dielectric constant, complex dielectric constant, dielectric loss, dielectric relaxation, Debye equations, classical theory of electronic polarization, ferroelectricity, ferroelectric domains, anti-ferroelectricity. Electronic band structure calculations: Tight-binding method, pseudo potentials and Augmented Plane Wave(APW) methods, nearly free electron approximation, OPW, Fermi surfaces(FS), effects of electric and magnetic field on FS, de Hass van Alfen effect, Cyclotron resonance, anomalous skin effect.

Unit IV: Magnetism and Superconductivity
Magnetism, Diamagnetism; Paramagnetism (Quantum treatment); Crystal-field effects; John-Teller effects; Adiabatic demagnetization; Molecular field theory of ferromagnetism; Heisenberg-exchange interaction; Spin Waves; Ginzburg-Landau theory of the ferromagnetism; Shape, Origin and observation of ferromagnetic domains; Dynamic Phenomena : Linear Response Theory, Hall effect, quantum Hall effect. Superconductivity: Phenomenological thermodynamic treatment, intermediate state, London’s equations and penetration depth, quantized flux, coherence length. Ginzburg-Landau theory, variation of the order parameter and the energy gap with magnetic field, isotope effect; Energy gap and its measurement; electron-phonon interaction and cooper pairs, brief discussion of the B.C.S. theory, its results and experimental verification; dc and ac Josephson effects, Type II superconductivity, mixed state, critical currents of type-II superconductors

Text Books:
6. C Kittel, Quantum Theory of Solids,: Wiley 1987

PHY-PG-C402: STATISTICAL MECHANICS II AND ATOMIC, MOLECULAR & OPTICAL PHYSICS

Unit I: Statistical Mechanics of Interacting System
Unit II: Fluctuations
Thermodynamic fluctuations, spatial correlations in fluid; Brownian motion, Einstein-Smoluchowski theory, Langevin theory; Fokker-Planck equation, Spectral analysis, fluctuation-dissipation theorem, Onsagar relations.

Unit III: Interaction of Atoms with Radiation

Unit IV: Non-linear Optical Susceptibility
Introduction, Schrödinger calculation of non-linear optical susceptibility, Perturbation solution of the Density matrix equation of motion, density matrix calculation of the Linear and second order susceptibility, Electromagnetic Induced transparency, Intensity dependent refractive Index. Experimental evidences: Optical Cooling and Trapping of Atoms, Magnetic trapping of neutral atoms, quantum information processing of the trapped ions

Text Books:
5. Atomic Physics- C J Foot, Oxford master series in Physics

Reference Books:

PHY-PG-C403: NUCLEAR & PARTICLE PHYSICS

Unit I: Nuclear Physics
Radioactivity, Alpha Decay, Beta Decay, Fermi Theory, Gamma Decay and internal Conversion, selection rules.

**Unit II: Elementary Particles**
Elementary particles, their quantum numbers and their weak, strong and electromagnetic interactions, quarks and leptons, quark model of hadrons, standard model. Relativistic kinematics; Symmetries and conservation laws; P,C and T discrete symmetries; CP violation.

**Unit III: Quantum Electrodynamics**
Lagrangian formulation of relativistic theory: Dirac equation and trace theorems. Perturbation expansion of correlation functions, Wick’s theorem, Feynman diagrams. Cross sections and S-matrices, Feynman rules for QED, elementary processes

**Unit IV: Gauge Theory**

**Text Books:**

**Reference Books:**

**PHY-PG-C404: PROJECT WORK AND PROGRAMMING TECHNIQUES**

This course consists of two components: Project Work for dissertation/thesis for 2 credits (50 marks) and programming techniques for 2 credits (50 marks).
A student’s project work should be a guided study of advanced topics not covered in the curriculum. It is expected that the student learns and applies some of the techniques and knowledge taught in the class through this Project Work. The main objective of the Project Work is to provide students with skill and knowledge in conducting research in fundamental and application aspects of physics/allied fields. Proper acknowledgement and permission of unavoidable earlier published work must be given in the thesis. If any kind of plagiarism is practised by the student, his/her dissertation or project work shall be liable to be rejected.

The Project Work of total 50 marks will be evaluated at the end of the semester by an evaluation committee consisting of the following four members: Head of the Department, the Supervisor, an Internal Examiner and an External Examiner. Another 50 marks of this course coming from Programming Techniques will be evaluated through internal assessment throughout the semester.


**Textbooks:**

**Reference Books:**
2. V. Rajaraman: *Computer based Numerical Methods*, Prentice Hall India, 1980,

**Open Elective Papers**

**PHY-PG-E203A: COSMOLOGY**

**Unit I: Expansion of universe**
Unit II: CMBR & Early Universe
Discovery of cosmic microwave background radiation, Equilibrium era, Recombination and last scattering, dipole anisotropy, primary fluctuations. Thermal history, Nucleosynthesis, Baryosynthesis, Leptosynthesis, cold dark matter.

Unit III: Inflation
Flatness, horizons, monopoles; slow roll inflation, chaotic inflation, eternal inflation. Perturbed Ricci and EM tensor, scalar, vector and tensor modes; Fourier decomposition, choice of gauge.

Unit IV: Cosmological Fluctuations & CMBR Anisotropy

Books:

PHY-PG-E203B: SPACE PHYSICS

Unit I: Motion of plasma particles and models
Characteristics of a plasma, Plasmas in space. Particle orbit theory: particles in constant external fields, guiding centre drifts, nonuniform magnetic fields, gradient and curvature drifts, magnetic bottling. Adiabatic invariatns. Models to study plasma: kinetic, fluid and MHD models, Boltzmann equation, Vlasov equation, Fokker-Planck equation. Ideal MHD.

Unit II: Waves in Plasmas

Unit III: Space Plasmas
Unit IV: Sun-Earth Connection and Instrumentation
Instruments to measure fields and waves. Plasma instruments. Energetic particle instruments. Supplementary ground-based observations

Text Books

PHY-PG-E203C: PHYSICS OF NANO AND SOFT MATERIALS

Unit I: Free electron theory [qualitative idea] and its features
Idea of band structure, metals, insulators and Semi-conductors. Density of state in bands, variation of density of states with energy, variation of density of state and band gap with size of crystal.

Unit II: Quantum Size Effect
Electron confinement in infinitely deep square well, confinement in two and one dimensional well, Idea of quantum well structure, quantum dots, quantum wires. Characterisation: Raman XRD, PL, RBS, TEM. Determination of particular size, Increase in width of XRD peaks of nanoparticles, Shift in photoluminescence peaks, variation in Raman spectra of nanomaterials.

Unit III: Methods of preparation of Nanomaterials
Bottom up: Cluster beam evaporation, Ion beam deposition, Ion implantation, Sputtering methods (Ion beam, Atom beam and RF sputtering, ultra high vacuum deposition), chemical bath deposition with capping techniques and top down: Ball Milling.

Unit IV: Soft Materials
Introduction to Soft Condensed Materials and their properties: Plastic and Liquid Crystals, Thermotropic (Nematic, Smectic and Discotic) and Lyotropic Liquid Crystals; Surfactants and Polymers; Colloids: Foams, Gels and Microemulsions; Biomaterials; Applications of Soft Materials.

Text Books:

**Reference Books:**

**PHY-PG-E303A: SOLAR HYDROGEN AND OTHER RENEWABLE ENERGIES**

**Unit I: Solar Energy**
Fundamentals of photovoltaic energy conversion Physics and material properties basic to photovoltaic energy conversion: optical properties of solids. Direct and indirect transition semiconductors, interrelationship between absorption coefficients and band gap recombination of carriers.

**Unit II: Types of Solar Cells**
p-n junction solar cell, transport equation, current density, open circuit voltage and short circuit current, brief descriptions of single crystal silicon and amorphous silicon solar cells, elementary ideas of advanced solar cells e.g. tandem solar cells. Solid liquid junction solar cells, nature of Semiconductor, electrolyte junction, principles of photo electrochemical solar cells.

**Unit III: Hydrogen Energy & Production**

**Unit IV: Storage and Safety**
Brief discussion of various storage processes, special features of solid state hydrogen storage materials, structural and electronic characteristics of storage materials. New Storage Modes. Various factors relevant to safety, use of Hydrogen as Fuel, Use in Vehicular Transport, Hydrogen for Electricity Generation, Fuel Cells, Elementary concepts of other Hydrogen Based devices such as Air Conditioners and Hydrides Batteries.
Books:

**PHY-PG-E303B: BIOPHYSICAL TECHNIQUES**

Unit I: Light scattering and Electron Microscopy
Elastic and inelastic scattering, light scattering by macromolecules, dynamic light scattering, radius of gyration and molecular mass. Transmission and scanning microscopy, negative staining, cryo-electron microscopy.

Unit II: Chromatography and Mass spectrometry
Electrospray MS, MALDI, applications. Paper Chromatography, TLC, column, gas-liquid, ion-exchange, size-exclusion and affinity chromatographies, HPLC and FPLC, applications to macromolecules.

Unit III: IR and Raman spectroscopy
Rotational and vibrational spectra, oscillator, molecular symmetry, optical density, investigations of molecular structure, hydrogen bonding. Raman spectra of amino acids, IR and Raman comparison, resonance Raman spectroscopy

Unit IV: Absorption and Fluorescence Spectroscopy
UV and Visible spectra, chromophores, CD and ORD, cotton effect, applications to proteins and nucleic acids, Frank-condon principle, classical picture, resonance condition, Bloch condition, relaxation phenomenon, Fourier transform technique, chemical shifts, coupling constraints, Karplus equation, analysis of simple spectra, NOE, proton magnetic resonance, 13C and 31P spectra.

Text Books:

Reference Books:

**PHY-PG-E303C: COGNITIVE SCIENCE**

Unit I: Introduction and Cognitive Psychology
Historical overview. Analyzing Information processes at several levels. Interdisciplinary nature of cognitive science, Application related system in the Cognitive Science. Nature of cognitive psychology, notion of cognitive architecture, propositional and schematic representation, cognitive processes: working memory and attention, mental images, reasoning, automatic and controlled processes, acquisition of skills.

**Unit II: Artificial Intelligence and Neuroscience**

History and background of Artificial Intelligence, Knowledge representation, Human information processing and problem solving: Search, Control and Learning. Introduction to nervous system, organisation of nervous system, neural representation, computational neuroscience, neural network and distributed information processing, neural network models of cognitive processes, strategies for brain mapping.

**Unit III: Cognitive Modelling**


**Unit IV: Biomedical Imaging Techniques**

An overview of X-ray, CT scan, PET scan, MRI scan, fMRI, EEG, MEG. Fundamental concepts of Image acquisition / Signal acquisition, Spatial Normalization, Affine and Nonlinear Image Registration, Spatial resolution, Temporal resolution, Contrast resolution, Image representation, Image Database, Image Data Communication and Data Compression, Image visualization such as various types of 2D and 3D rendering techniques.

**Text Books:**


**PHY-PG-E303D: QUANTUM FIELD THEORY**

**Unit I: Scalar and Spinor Fields**

Need for Field Theoretic description, Klein-Gordon Field: Lagrangian formulation, symmetries and conservation laws, canonical quantization, propagators, Feynman diagrams
Dirac Field: Canonical quantization, propagators, Symmetries: Gauge Symmetries, Gauge Field: Elementary realization of BRST symmetry and gauge fixing.

Unit II: Interactions

Unit III: Renormalization

Unit IV: Non-Abelian Gauge Field
Non-Abelian Gauge invariances, Quantizations, Quantum Chromodynamics, Operator products, effective vertices, Gauge theory with spontaneous symmetry breaking, Higgs mechanism.

References
Physics is one of the most important subjects. Not only for lower classes but also for higher classes. Concepts of Physics also helps you to clear many entrance exams like JEE Main, JEE Advanced, etc. Follow the links below to learn each and every concept of Physics with video lectures. CBSE Class 8 Physics Syllabus. In Class 8 Physics you will have 7 different units. The first unit is Chemical effect of Electric current. Class 10 Physics covers 5 Chapters. The first chapter is about Electricity which covers Ohms Law and resistance, the heating effect of electric current, circuit diagrams, and more.