

Kumaun University Nainital

Semester System (2019 onwards)

B.Sc. (PHYSICS)

THREE-YEAR FULL-TIME PROGRAMME (Three year Course)

(Annual Mode)

**Science Faculty
(Department of Physics)**



COURSE CONTENTS

Kumaun University Nainital

Approved by BOS (16.10.19)
[Signature]

Kumaun University Nainital

B. Sc. Syllabi for Physics (Session July 2019 Onwards)

Three Years Degree Course Structure (Annual Mode)

Year-wise Distribution of Papers

I. First Year

Paper 1: Mechanics and Theory of Waves and Oscillations
Paper 2: Electricity and Magnetism

Practical

II. Second Year

Paper 1: Heat, Thermodynamics and Statistical Physics
Paper 2: Optics

Practical

III. Third Year

Paper 1: Modern Physics
Paper 2: Electronics

Practical

Note:

1. Marks for each theory paper: 150 (Time: 3 Hours)
2. Marks for each practical exam: 100 (Time: 4 Hours with minimum 2 Practicals)
3. Total marks for each Year: 400
4. Distribution of the number of questions/marks in each theory question paper:
 - a) Six short answer questions out of eight each carrying 15 marks.
 - b) Three long answer questions with internal choice each carrying 20 marks.

Detailed Syllabus

B.Sc. (Physics) Three Years Degree Course Structure (Annual Mode)

First Year

Paper 1: Mechanics and Theory of Waves and Oscillations

Unit-I: Vector Analysis

Unit-II: Gravitation, Conservation Laws and Dynamics of Rigid Bodies

Unit-III: Properties of Matter

Unit-IV: Theory of Oscillations

Unit-V: Analysis of Wave Motion

Paper 2: Electricity and Magnetism

Unit-I: Electric Field and Potential

Unit-II: Electric and Magnetic Field in Matter

Unit-III: Electric Currents (AC and DC)

Unit-IV: Magnetostatics and Electromagnetic Induction

Unit-V: Theory of Electromagnetic Waves

Practicals

B.Sc. (Physics) Three Years Degree Course Structure (Annual Mode)

First Year

Paper 1: Mechanics and Theory of Waves and Oscillations

Unit-I: Vector Analysis

Triple product of vectors, scalar and vector field, Calculus of vectors, Application of vectors to linear and rotational quantities, Del operator, Gradient, Divergence and Curl of vectors, Gauss's, Stokes's and Green's theorem (Physical Examples).

Unit-II: Gravitation, Conservation Laws and Dynamics of Rigid Bodies

Gravitational field and potential, Gravitational potential energy, Gravitational field Intensity and potential due to a ring, a spherical shell, solid sphere and circular disc, gravitational self energy, Inverse square law of forces, Kepler's laws of planetary motion

Concept of inertial and Non-inertial frames of references, Work energy theorem, Conservative and non-Conservative forces, Linear restoring force, Gradient of potential, Conservation of energy for the particle; Energy function, Concept of Centre of mass, Angular momentum and torque, Laws of conservation of total energy, total linear momentum and total angular momentum alongwith their examples.

Translatory and Rotatory motion, Equation of motion for Rotating rigid body, angular momentum vector and moment of inertia, Theorem of parallel and perpendicular axes, Moment of inertia of a cylinder, rod, lamina, ring, disc, spherical shell, solid sphere, kinetic energy of rotation, rolling along a slope, Application to compound pendulum

Unit-III: Properties of Matter

Basic concept, Elastic constants and their Interrelations, torsion of cylinder, bending of beam, bending moment, Cantilever, shape of Girders/ rail tracks.

Viscosity, Stokes's law, Poiseuille's formula, Equation of continuity, Bernoulli's theorem, Surface tension and its molecular interpretation.

Unit- IV: Theory of Oscillations

Periodic motion, SHM in mechanical systems, Energy of Simple harmonic oscillator, Superposition of SHM(s), Oscillations of two masses connected by a spring, Non-linear (Anharmonic) oscillator and its applications to simple pendulum

Damping force, Different cases for over, critical and under damping, Mechanical damped harmonic oscillators, Logarithmic decrement, Power Dissipation, Relaxation time & Quality Factor.

Forced oscillations, Mechanical driven harmonic oscillators, Transient and steady state behavior, Power absorption, phenomenon of resonance, amplitude resonance, velocity resonance, sharpness of resonance/Fidelity, Bandwidth and quality factor,

Applications of Simple harmonic motion in compound pendulum, Torsional pendulum and LC circuit, Composition of two SHM(s) of different frequency ratio, Lissajous' figures for equal frequencies ratio and 2:1 frequencies ratio, Applications of Damped Harmonic and Forced oscillations for moving coil galvanometer and LCR circuits.

Unit-V: Analysis of Wave Motion

Characteristics, Differential equation of a wave motion, principle of superposition, Interference, Beats, stationary waves, Energy of stationary waves, Wave velocity and group velocity, Fourier theorem, Fourier analysis of square, triangular and saw-tooth waves.

Classification of Sound waves, Ultrasonics, Quartz crystal and Piezo electric effect, Magnetostriction effect, Properties of Ultrasonic, Detection of ultrasonic waves, Determination of velocity of ultrasonic waves in liquid (Acoustic grating method)

Energy density of plane acoustic waves, Acoustic intensity, Measurement of acoustic intensity – the dB scale, Characteristics and loudness of Musical sound,

Acoustic impedance, Reflection and transmission of acoustic waves.

Application of wave propagation in various physical cases, Applications of Ultrasonics, Acoustics of buildings, reverberation time, Sabine's formula, Principle of sonar system.

Books Recommended:

1. R. Resnick and D. Hilliday: Physics Vol-I
2. Berkeley physics course Vol-I (McGraw Hill)
3. R.P. Feynman, R.B.Lightan and M.Sand: The Feynman Lectures in Physics.
4. D.S. Mathur: Mechanics (S.Chand and Co.).
5. D.S. Mathur: Elements of Properties of Matter (S.Chand and Co.).
6. B.S. Rajput: Physics for Engineers Vol II (Pragati Prakashan).
7. J.C. Upadhayay: General Properties of matter Vol-I.
8. Brijlal and Subrahmanyam, "Waves and Oscillations", S.Chand and Co
9. B.S.Semwal and M.S.Panwar, "Wave Phenomena and material Science"
10. R.K.Ghose, "The mathematics of waves and Vibrations" McMillan
11. D.P.Khandelwal, "Oscillations and Waves" Himalaya Publishing
12. I.I.Pain "Physics of Vibration"
13. A. P. French, "Vibrations and Waves" (CBS Pub. & Dist., 1987)
14. Satya Prakash; Waves and Oscillations, Pragati Prakashan.

Paper 2: Electricity and Magnetism

Unit-I: Electric Field and Potential

Coulomb law, Gauss' theory, its integral and differential forms, line integral of Electric field, Electric field and potential due to an arbitrary charge distribution. Electrostatic energy, energy stored in an Electric field. Electric field and potential due to long charged wire, Spherical shell, sphere, disc, dipole.

Unit-II: Electric and Magnetic fields in Matter

Moments of charge distributions, Polar and non-polar molecule, polarization vector, electric displacement vector, three electric vectors, dielectric susceptibility and permittivity, polarizability, Clausius-Mossotti relation.

Magnetization, magnetic susceptibility, diamagnetic, paramagnetic and ferromagnetic substances, Hysteresis and B-H curve, Langevin's theories of Diamagnetism and paramagnetism, Weiss theory of ferromagnetism.

Unit-III: Electric Currents (AC and DC)

Electric Current, Equation of continuity, electrical conductivity, Lorentz-Drude theory, Wiedmann-Frenz law, Transient currents, R-C circuit, Time constant.

Impedance, admittance and reactance, R-C, R-L and L-C circuits with alternative e.m.f. source, series and parallel L-C-R circuits, resonance and sharpness, Power in A-C circuits, choke coil.

Unit-IV: Magnetostatics and Electromagnetic Induction

Lorentz force, Bio-Savert's law, Ampere's law, Application of Biot-Savert law, magnetic field due steady current in a long straight wire, Interaction between two wires, field due a Helmholtz coil, solenoid and current loop, magnetic vector potential, permeability, Energy stored in Magnetic field.

Faraday's laws of induction, Lenz's law, Electromotive force, Measurement of magnetic field,

Eddy current, Skin effect, Mutual inductance, Self inductance.

Unit-V: Theory of Electromagnetic Waves

Maxwell's equations in differential and integral forms, Electromagnetic energy and Poynting theorem, Wave equations, Plane electromagnetic waves in free space, Maxwell's equations for isotropic, nonisotropic and dielectric medium.

Books Recommended:

1. Berkeley Physics Course Vol.II (McGraw Hill)
2. R. Resnick and D. Halliday: Physics Vol-II
3. D.C. Tayal "Electricity and Magnetism" Himalaya Publishing.
4. Mahajan and Rangwala "Electricity and Magnetism" (Tata McGraw Hill).
5. B.B.Laud, "Electricity and Magnetism"
6. K.K Tewari, "Electricity and Magnetism", S. Chand and Co

Practicals:

List of Experiments for B.Sc. Year-I (at least fifteen experiments)

1. Determination of modulus of rigidity (dynamical, statical method).
2. Young's modulus by bending of beam of known material.
3. Elastic constants by Searle's method (η , γ and σ).
4. Moment of inertia of a fly wheel.
5. Inertia table Experiment.
6. Surface Tension determination.
7. Viscosity of water by Posieuille's method.
8. Calibration of ammeter by potentiometer.
9. Calibration of voltmeter by potentiometer.
10. Specific resistance determination.
11. Conversion of Galvanometer in to a voltmeter.
12. Conversion of Galvanometer in to a ammeter.
13. Charging and discharging through a capacitor.
14. De Sauty's bridge- C_1/C_2 .
15. R_1/R_2 by potentiometer.
16. To determine High Resistance by Leakage of a Capacitor.
17. Determination of Ballistic Constant.
18. Comparison of capacities by Ballistic Galvanometer.
19. Variation of magnetic field along the axis of a current carrying circular coil.
20. Hysteresis.
21. Determination of self inductance/ Mutual inductance.
22. Study of R-C, LCR circuits
23. Oscillations of mass spring system.
24. Study of compound (Kater's) pendulum.
25. Study of compound (Bar) pendulum.
26. Study of relaxation in a simple pendulum.
27. Study of under damped harmonic oscillator.
28. Torsional oscillations (Maxwell's needle experiment).
29. Melde's Experiment.
30. Lissajous figures.
31. To prove the laws of vibrating strings and determine the frequency of A.C mains
32. Determination of Ultrasonic velocity.

B.Sc. (Physics) Three Years Degree Course Structure (Annual Mode)

Second Year

Paper 1: Heat, Thermodynamics and Statistical Physics

Unit-I: First and Second Law of Thermodynamics and Entropy

Unit-II: Thermodynamic Relations

Unit-III: Transfer of Heat

Unit-IV: Kinetics Theory of Gases

Unit-V: Basic Concepts in Statistical Physics

Paper 2: Optics

Unit-I: Fermat's Principle and Theory of Image Formation

Unit-II: Optical Aberrations and Dispersion

Unit-III: Interference

Unit-IV: Diffraction

Unit-V: Polarization

Practicals

B.Sc. (Physics) Three Years Degree Course Structure (Annual Mode)

Second Year

Paper 1: Heat, Thermodynamics and Statistical Physics

Unit-I: First and Second Law of Thermodynamics and Entropy

Thermodynamic Systems, Thermal equilibrium and Zeroth law of thermodynamics, Equation of state and First law of thermodynamics, Discussion of Heat and Work, Quasi-static Work; Reversible and Irreversible; Path Dependence; Heat Capacities Adiabatic Processes, Vander Wall equation, Distinction between Joule, Joule-Thompson and Adiabatic expansion of a gas.

Insufficiency of first law of thermodynamics, Condition of Reversibility, Carnot's Engine and Carnot's Cycle, Second law of thermodynamics, Carnot's Theorem, Thermodynamic scale of temperature and its identity to perfect gas, scale of temperature.

Entropy, Mathematical formulation of Second law of thermodynamics, Entropy of an ideal gas, T-S diagram and its applications, Evaluation of Entropy changes in simple cases, Third law of thermodynamics.

Unit-II: Thermodynamic Relations

Thermodynamic potentials, Maxwell's equation from thermodynamic potentials, Some useful manipulations with partial derivatives (cooling in adiabatic processes and Adiabatic stretching of a wire), The Clausius-Clapeyron's equations, Triple point, Applications of Maxwell's thermodynamical relations.

Unit-III: Transfer of Heat

Modes of heat transfer via Conduction, Convection and Radiation, Fourier's law, One dimensional steady state conduction, Heat conduction through plane. Thermal conductivity and its experimental detection, Newton's law of cooling, Dimensional analysis applied to forced and free convection.

Black body radiation, Thermodynamics of radiations inside a hollow enclosure, Kirchoff's Laws, Derivation of Stefan Boltzmann Law, Wein's displacement law, Black body spectrum formula-

early attempts, Raleigh Jean's Law, Quantum theory of Radiation, Planck's formula for black body spectrum, Wien's law, Radiation as a photon gas.

Unit-IV: Kinetics Theory of Gases

Kinetic theory of gases, Microscopic description of an Ideal gas, Degrees of freedom, Law of Equipartition of Energy, Distribution law of velocities, Most probable speed, Average speed and root mean square velocity of molecules, Pressure exerted by a perfect gas, Kinetic Interpretation of Temperature.

Unit-V: Basic Concepts in Statistical Physics

Basic postulates of Statistical Physics, Macro and Micro States, Phase Space, Density distribution in phase space, μ space representation and its division, Statistical average values, Condition of equilibrium, Stirling's Approximation, Entropy and Thermodynamic probability, Boltzmann entropy relation.

Ensembles, Micro-canonical, Canonical and Grand Canonical ensembles, Statistical definition of temperature and interpretation of second law of thermodynamic, Pressure, Entropy and Chemical potential. Entropy of mixing and Gibb's paradox, Partition function and Physical significances of various statistical quantities.

Maxwell-Boltzmann statistics and Distribution law, Energy distribution function, Maxwell Boltzmann law of velocity distribution (most probable velocity, average velocity, RMS velocity), Limitations of M-B statistics, Elementary idea of quantum statistics.

Books Recommended

1. S. Loknathan, "Thermodynamics, Heat and Statistical Physics" (Prentice Hall India)
2. Sharma and K.K. Sarkar "Thermodynamics, and Statistical Physics" (Himalaya Pub)
3. Brijlal and Subrahmanyam, "Heat and Thermodynamics" (S Chand)
4. Saha and Srivastav "Treatise on heats", (The Indian Press Publications)
5. S.C. Garg, R.M. Bansal and Ghose, "Thermal Physics" (Tata McGraw-Hill)
6. Zemansky and Dittman: Heat and Thermodynamics (The McGraw-Hill)

Paper 2: Optics

Unit-I: Fermat's Principle and Theory of Image Formation

Fermat's principle of extremum path and its application to deduce laws of reflection and refraction, Refraction at concave surface, Principal foci, Lateral and longitudinal magnifications, Aplanatic points of spherical surface.

Gauss's general theory of image formation, Coaxial symmetrical system, Cardinal points of an optical system, General relationships, Thick and Thin lens, lens combinations, Newton's formula, Coaxial lens system, Lagrange's equation of magnification, Refraction through a thick lens.

Nodal Slide, Eyepiece, Ramsden's, Huygen's and Gaussian eyepieces, Their comparison, Astronomical refracting telescope, Microscopes, Spectrometer and its uses, Oil immersion objectives meniscus lens.

Unit-II: Optical Aberrations and Dispersion

Aberrations in images, Spherical aberration, Monochromatic and Chromatic aberration, Condition of achromatism, Achromatic combination of lenses in contact and separated lenses, Spherical mirrors and Schmidt corrector plates, Theory of dispersion.

Unit-III: Interference

The principle of superposition, Two slit interference, coherence, Division of wave front and amplitude, Optical path retardations lateral shift of fringes, Fresnel biprism, Interference with multiple reflection, Thin films, Application for precision measurements, Haidinger fringes, Fringes of equal thickness and equal inclination.

Michelson interferometer and its application for precise measurement of wavelength, Wavelength difference and width of spectral lines, Twyman-Green interferometer, Tolansky fringes, Fabry-Perot interferometer and Etalon.

Unit-II: Diffraction

Fresnel's and Fraunhofer diffraction: Diffraction of single slit, Zone plates, intensity distribution, Resolution of image, Rayleigh criterion, Resolving power of telescopes and microscopes, Diffraction due to 2-slits and N-slits, Diffraction grating, Resolving power of grating and comparison with resolving powers of prisms.

Unit-III: Polarization

Plane polarized, Circular polarized and elliptically polarized light, Malus law, Brewster's law, Double reflection and uniaxial crystals, Application of bi-refringence, Dichroism, Optical rotation, Rotation of plane of polarization, Optical rotation in liquids and crystals, Polarimeter.

Books Recommended

1. D.P. Khandelwal and "Optics and Atomic Physics" (Himalaya, Publishing House) .
2. Jenkins and White "Fundamentals of Optics" (Tata McGraw-Hill)
3. A.K. Ghatak "Physical Optics", (Tata McGraw-Hill)
4. Brijlal and Subrahmanyam, "Optics" (S Chand)
5. K.D. Moltev "Optics" (McGraw-Hill)
6. B. K. Mathur, "Optics" (Gopal Printing Press)

Practicals:

List of Expts. for B.Sc. year-II (at least fifteen experiments which cover understanding of theory course)

1. Thermal conductivity of bad conductor.
2. Mechanical equivalent of heat by Searle's method.
3. Thermal conductivity of a good conductor by Searle's method.
4. To study the variation of Thermo-emf of a Thermocouple with Different Temperature.
5. Stefan's Law and to determine the Stefan's constant.
6. Platinum resistance thermometer.
7. J-Callendar and Barne's method.
8. Newton's law of cooling - Specific heat of kerosene oil.
9. To determine the Critical temperature and critical pressure of a gas.
10. To measure temperature with the help of Joule's constant volume air thermometer.
11. Nodal slide assembly, Location of cardinal points of lens system.
12. Newton's formula.
13. Dispersive power of prism.
14. Resolving power of a telescope.
15. To determine the Resolving Power of a Prism.
16. Biprism- determination of λ .
17. Newton's ring experiment- Determination of λ .
18. Determination of λ by a transmission grating.
19. Cauchy's formula.
20. Zone-plate experiment study of different orders.
21. Absorption of light.
22. Malus' Law.
23. Specific rotation in cane sugar solution.
24. To determine the thickness of mica-sheet by using Biprism.
25. Random events- Statistical board method.

B.Sc. (Physics) Three Years Degree Course Structure (Annual Mode)

Third Year

Paper 1: Modern Physics

Unit-I: Origin of Quantum Mechanics and its Operator Formulation

Unit-II: Schrodinger Equation and its Applications

Unit-III: Atomic Models and Optical Spectra

Unit-IV: Theory of Lasers and Molecular Spectroscopy

Unit-V: Basics of Subatomic and Particle Physics

Paper 2: Electronics

Unit-I: Network Theorems and Applications

Unit-II: Power Supplies

Unit-III: Solid State Devices

Unit-IV: Amplifiers and Oscillators

Unit-V: Basics of Digital Electronics

B.Sc. (Physics) Three Years Degree Course Structure (Annual Mode)

Third Year

Paper 1: Modern Physics

Unit-I: Origin of Quantum Mechanics and its Operator Formulation

Origin of quantum theory, limitation of Classical Physics, Black body Radiation, Planck's radiation law and Einstein's explanation, The photo electric effect and Einstein correction, Compton effect.

De Broglie's Hypothesis, Wave-Particle Duality, Davisson-Germer Experiment, G.P Thomson experiment, Taylor's experiment, Wave description of Particles by Wave Packets, Group and Phase Velocities, Principle of Complimentarity, Heisenberg Uncertainty principle, Gamma ray microscope, Single slit experiment.

Linear vector space, Linear Operator, Definition of position, momentum , Energy and Angular momentum operator, Eigen value and Eigen functions, Hermitian operators, Postulates and basic theorems of Quantum mechanics, Operator method for solving Eigen values problem, Energy of Harmonic oscillator.

Unit-II: Schrodinger Equation and its Applications

Origin of non relativistic Quantum Mechanics, Overview of wave mechanics, Simple one dimensional quantum system Oscillator, Time independent and time dependent one dimensional Schrödinger equation, Steady state solutions, Physical interpretation of wave functions, probability current density, Ehrenfest's theorem, Particle in a box, Idea of Tunneling

Unit-III: Atomic Models and Optical Spectra

Thomson model, Rutherford model, Bohr model and spectra of hydrogen atom, Fine structure, Bohr Magnetron, Larmor's precession, Somerfield model, Stern-Gerlach experiment, Vector atomic model, Space Quantization and Spinning of an electron.

Optical spectra, Spectral notations, L-S, J-J coupling, Selection rules and intensity rules, Explanation of fine structure of Sodium D line, Zeeman effect, X-ray spectra(characteristics and continuous), Moseley's law.

Unit-IV: Theory of Lasers and Molecular Spectroscopy

Einstein A and B coefficients, Spatial and Temporal coherence, Optical pumping, Population inversion, Laser action, Basic idea of LASER and MASER, Ruby Laser and He-Ne laser, Some applications.

Franck-Condon Principle, Molecular spectra, Rotational, Vibration and Electronic spectra of diatomic molecules, General features of electronic spectra, Luminescence, Basics of Raman effect.

Unit-V: Basics of Subatomic and Particle Physics

Structure of atomic nucleus, nuclear properties (charge, mass, spin, shape), nuclear binding energy, liquid drop model and semi-empirical mass formula, elementary particles and their classification schemes.

Books Recommended

1. L.I. Schiff, "Quantum Mechanics" (McGraw Hill Book Co.)
 2. Chris J. Isham, "Lectures on Quantum Theory" (Allied Publisher)
 3. B.S. Rajput , "Advanced Quantum Mechanics" (Pragati Prakashan)
 4. Ghatak and Lokanathan , "Quantum Mechanics" (Macmillan Pub.)
 5. Mathew and Venkatesan , "Quantum Mechanics"(Tata McGraw-Hill)
 6. A. Beiser , Perspective of Modern Physics, (Tata McGraw Hill)
 7. H.S. Mani and Mehta, Introduction to Modern Physics , (Allied East West Press)
- David Mc mohan: Quantum Mechanics (McGraw Hill)

Paper 2: **Electronics**

Unit-I: **Network Theorems and Applications**

Kirchhoff's Laws, Superposition Theorem, Constant voltage source and constant current source, Conversion of voltage source into current source, Thevenin's Theorem and procedure for finding thevenin equivalent circuit, Norton's Theorem and procedure for finding Norton equivalent circuit, Maximum power transfer theorem, Applications of Network Theorems, Four terminal Network and h-parameters.

Unit-II: **Power Supplies**

Semiconductor diode: P-N Junction diode, Diode Parameters, Equation of diode current, Diode circuits with DC and AC Voltage sources, Diode as a rectifier: Half and Full wave rectifiers, Bridge rectifiers, Peak inverse voltage, Efficiency, Ripple factor, Filters: Low pass and High pass filters, Band pass and Band stop filters, L and π – filters (Series inductor, Shunt capacitor, LC, CLC filters), Zener diode, its characteristics, Voltage regulation.

Unit-III: **Solid State Devices**

Special Diodes: Tunneling effect, Tunnel diode, Varactor diode, Point contact diode, V-I characteristic of these diodes, Optoelectronic devices: Light emitting diode, Photodiode, Photo multiplier tube, Bipolar junction transistor, Transistor operation and its Biasing rule, Transistor currents, Transistor circuit configuration (CB, CE, and CC configuration), Transistor characteristics in different configuration, cut-off and saturation points, Active region, Leakage current in transistor and thermal runaway, Relation between transistor current in various configuration, General idea of FETs.

Unit-IV: **Amplifiers**

Single-stage transistor amplifiers, Common base (CB) amplifier, various gains of a CB amplifier, Common emitter (CE) amplifier, various gains of a CE amplifier, characteristics of a CE amplifier, Common collector (CC) amplifier, various gains of a CC amplifier, characteristic of a CC amplifier, Comparison of a amplifier configurations, Amplifier classification based on biasing condition, Power amplifiers (Class A, Push-Pull amplifier, Class B and Class C), Noise

and Distortion in amplifiers, Multistage amplifier, Amplifier coupling, RC- coupled two stage amplifier and its frequency response, Advantage of RC coupling, Transformer coupled two stage amplifiers and its frequency response, Advantage of transformer coupling.

Unit-V: Basics of Digital Electronics

Number systems, Decimal, Binary, Octal and Hexadecimal number systems, Binary to decimal conversion, Double-Dadd method, Binary operations, Binary addition, Binary subtraction, Complement of a number (1's complement and 2's complement), Binary division, Representation of a Binary number as electrical signals, Conversion of Binary to octal, Binary to hexadecimal and vice-versa (Inter-conversion), BCD, GREY, EXCESS-3 codes, Boolean algebra, Features of Boolean algebra, Laws of Boolean algebra, Equivalent switching circuit, Demorgan's theorems and Duals.

Positive and Negative logic, Two input OR gate, Diode OR gate and transistor OR gate, Three input OR gate and its truth table, Exclusive OR gates, The AND gate, Diode AND gate and transistor AND gate, The NOT gate, Bubbled gates, The NOR gate, The NAND gate, NAND and NOR as universal gates, The XNOR gate, Adders and subtractors, Half Adders, Full adders, Paralled binary adder, Half subtractor and Full subtractor.

Books Recommended:

1. M.K. Baagde, S.P. Singh and Kamal Singh, Elements of Electronics (S. Chand and Co).
2. B.L. Theraja, Basic Electronics (S.Chand and Co.)
3. V.K. Mehta, Elements of Electronice (S.Chand and Co.)
4. J.D. Ryder: Networks, Lines and Fields (Pritice Hall Edition)
5. Brophy, Communication Electronics (McGraw-Hill Education)
6. R Boylested , Electronic Devices & Circuit theory (PHI)

Practicals:

List of Experiments for B.Sc. Year III (at least fifteen experiments which cover the understanding of theory course)

1. To study characteristics of R-C coupled Amplifier.
2. To study the characteristics of integrating and differentiating circuit.
3. To draw the characteristics of P-N junction diode.
4. To draw the characteristics of PNP and NPN junction transistor.
5. Measurements of h-parameters of a transistor.
6. Study of different types of Rectifiers and Filters.
7. Verification of Network theorems.
8. Child Langmuir law.
9. Triode/ Tetrode/ Pentode characteristics and constants.
10. Study of power supply (Ripple factor).
11. Study of Zener diode and regulation (taking different source voltage and loads).
12. Phase measurement using a C.R.O.
13. Study characteristics of T.C. Amplifier and B.W.
14. To study the Characteristics of a Photo-diode.
15. Inverse square law using Photo-Voltaic Cell.
16. Frank-Hertz Experiment.
17. Determination of 'h' Planck's constant by Photoelectric effect.
18. Spectrum of Hydrogen and Rydberg constant.
19. Speed of light by Leacher's wires.
20. 'e/m' by Thomson method.
21. 'e/m' Magnetron method.
22. 'e/m' Helical method
23. Wave shapes and frequency of Multivibrators.
24. Ionization potential of mercury.
25. Band gap energy of semiconductor using a junction diode.
26. Study of logic gates.
27. To study characteristics of R-C coupled Amplifier with and without feedback