KANNUR UNIVERSITY

SYLLABUS
for
M Sc Physics (Advanced Materials)
Entrance Examination

2018

DEPARTMENT OF PHYSICS, KANNUR UNIVERSITY

Physics Fundamentals

Module 1: Perspective of physics

What does physics deal with? Brief history of physics during last century-Planck's hypothesis of quantum. Quantum mechanics-EInsteins theory of relativity-Contributions by Bose,Saha, Raman and Chandrasekhar. Semiconductor revolution in physics, Nano techonology ,Expanding Universe, Fundamental particles, Standard model of high energy physics,Higgs boson ,Unification of all forces.

(Book 1 & 2)

Module 2: Mathematical methods in Physics

Vector Analysis: Vector operations-vector Algebra-Component form-vector calculus- Del operator-gradient, divergence, curl-physical interpretation-Integral calculus-Line integral. Surface integral, volume integral-l fundamental theorem of gradients-gauss divergence theorem (statement only) fundamental theorem of curl-stokes theorem (statement only) Divergence less and cur less fields. Curvilinear co–ordinates, spherical polar coordinates-cylindrical co-ordinates (basic ideas)

(Book 3, Chapter 1)

Module 3: Waves and oscillations

Waves-Progressive wave-General equation of wave motion- plane progressive harmonic wave-Energy density-Transverse waves in stretched strings-longitudinal waves in rods-longitudinal waves in gases-Fouriers theorem-mathematical expression-conditions.

Harmonic oscillator: Simple harmonic motion and harmonic oscillator—Energy of harmonic oscillator-oscillation of two particle connected by a spring- vibrational state of a diatomic molecule-compound pendulum - composition of two simple harmonic motions of equal periods in straight line, composition of two rectangular simple harmonic motion of equal periods-Lissajous figures.

(Book 4,Chapters 9,10)

Books for study:

1. Concepts of modern physics by Arthur Beiser

2. Modern Physics by R. Murugeshan

3. Introduction to Electrodynamics by David J Griffith Prentice Hall India Pvt Ltd .

4. Mechanics by J.C. Upadhyaya.

Books for reference:

1. Introduction to Mathematical Physics by Charlie Harper

2. Properties of matter by J.C.Upadhyaya

Electronics I

Module 1: Bipolar Junction Transistors and their biasing

BJT Operation, BJT Voltages and Currents, BJT amplification, CB, CE and CC Characteristics, DC Load line and Bias point, Base bias, Collector to base bias, Voltage divider bias, Comparison of bias circuits, Bias circuit design, Switching circuits.

(Book 1, Chapter 4 & 5)

Module 2: Field Effect Transistors and their biasing

Introduction, JFET - n channel and p channel, JFET characteristics, DC load line and bias point, Gate bias, Self bias and Voltage divider bias.

(Book 1, Chapter 9 & 10)

Module 3: Number Systems, Operations and Codes

Binary numbers, Decimal to Binary Conversion, Binary Arithmetic, 1's and 2's Complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed Numbers, Hexadecimal Numbers, Octal Numbers, Binary Coded Decimals, Gray code, ASCII code.

(Book 2, Chapter 2)

Module 4: Logic gates

The inverter, AND, OR, NAND, NOR, The Exclusive-OR and Exclusive-NOR Gates, Basic combinational Logic circuits, The universal property of NAND and NOR gates, Combinational logic using NAND and NOR gates.

(Book 2, Chapter 3 & 5)

Books for Study:

1. Electronic Devices and Circuits - 5th Edition, David A Bell (Oxford)
2. Digital Fundamentals - 8th Edition, Thomas L. Floyd (Pearson Education PHI)

Books for Reference:

1. Principles of Electronics - V K Mehta (S Chand & Co.)
2. Electronic Devices and circuit theory - Robert L Boylestad & Louis Nashelsky (PHI)
3. Digital Principles and Applications - D P Leach and A P Malvino (TMH)

Allied Physics

Module 1: Solid State Physics

Crystal structure:-Introduction- crystal lattice and translation vectors- unit cell-basis-symmetry operations–point groups and space groups(qualitative) - types of lattices - Bravais lattices–lattice directions and planes-Miller indices-inter planar spacing for orthogonal lattice(no derivation)-simple crystal structures-close packed structures-loose packed structures-structure of diamond –structure of sodium chloride

X-ray diffraction: Bragg's law –X-ray diffraction methods-Laue's method- Powder crystal method- powder method

(Book 1, Chapter1, 2)

Module 2: Properties of matter

Elasticity:- Stress, strain, elastic constants, Poisson's ratio relation connecting various elastic constants- angle of twist and angle of shear – twisting couple on a cylindrical rod of wire – torsion pendulum- Bending of beams –expression for bending moments-cantilever- expression for depression –beam supported at its ends and loaded in the middle-expression for depression –stiffness of a beam

Hydrodynamics:- Streamline and turbulent flows-tubes of flow and equation of continuity-energy possessed by a liquid- Bernoulli's theorem-practical applications-Torricelli's theorem

Viscosity:-critical velocity-flow of liquid through a capillary tube (Poiseulle's formula)-Stokes formulae.

Surface tension:-surface energy-expression for excess pressure on a curved surface - measurement of surface tension by capillary tube method

(Book 2- Chapters 12,14,15,16)

Module 3: Electricity

DC Network theorems:-Kirchoff's laws –voltage and current sources-source conversion-superposition theorem- Maximum power transfer theorem- reciprocity theorem- Thevenin's and Norton's theorems –equivalent circuits-star/delta ,delta/star transformations

Transients and ac circuits:- Charging and discharging of capacitor- time constants-ac through R,L and C-choke coil-skin effect-ac through LR, CR and LCR series and parallel circuits-resonance-power in ac circuits-power factor

(Book 3, Chapters 2, 5,10,11,13)

Books for study:

1. Solid state Physics, R.K.Puri, V.K. Babbar, S. Chand and Company
2. Mechanics: J. C. Upadhyaya , Ram Prasad and sons.
3. A text book of Electrical Technology, Volume 1, 22nd Edn., B.L.Theraja & A.K.Theraja.

Books for Reference:

1. Solid State Physics, M.A. Wahab, Narosa publishing house

2. Introduction to solid State Physics, Charles Kittel, John Wiley and sons

3. Properties of matter, Brijilal-Subrahmaniam, S.C&Co

4. Elements of properties of matter, D.S.Mathur, S.Chand

5. Fundamentals of magnetism and electricity, D.N.Vasudeva

Optics

Module 1:- Matrix Method in Paraxial Optics

Introduction-The Matrix method-Effect of Translation-Effect of Refraction-Imaging by spherical refracting surface- coaxial optical systems-unit planes-Nodal planes –a system of thin lenses

(Chapter 4)

Module 2:-Interference by division of amplitude

Introduction-Interference by a parallel film when illuminated by a plane wave-The cosine law-Non reflecting films-Highly reflecting films by thin film deposition-Interference by a film with two non parallel reflecting surfaces-Colour of thin films-Newton's Rings (reflected system)-Michelson's Interferometer-determination of wavelength of monochromatic source

(Chapter13)

Module 3:- Fresnel Diffraction

Introduction-Fresnel half period zones-Diffraction by a circular aperture-The zone plate-comparison between zone plate and convex lens-Diffraction by a straight edge

(Chapter 17)

Module 4 :- Fraunhoffer Diffraction

Introduction-Single slit diffraction pattern-Position of maxima and minima-Two slit Fraunhoffer diffraction pattern-position of maxima and minima-N slit diffraction pattern-position of maxima and minima-Width of principal maxima-The plane diffraction grating-Grating spectrum-Resolving power of a grating.

(Chapter 16)

Module 5 :- Polarization and Double refraction

Introduction-Polarization by reflection-Brewster's law- Nicol prism-Polarization by scattering- Malus's law -Superposition of two disturbances-Mathematical analysis-The phenomenon of double refraction-Interference of polarized lights-Quarter wave and Half wave plates-Analysis of polarized light.

(Chapter 19)

Book for study :

Optics by Ajoy Ghatak (3rd Edition) -Tata MC Grow hill publishing company

Books for Reference :

1. Geometrical and Physical optics by P.K.Chakroborthy
2. A text book of Optics by N.Subramhaniam and Brijlal
3. Optics by E. Hecht.

Electrodynamics-I

Module 1: Electrostatics.

The electrostatic field –Coulomb's Law-The electric field-Continuous charge distributions-Field lines & Gauss's Law –The divergence of **E-** Dirac Delta function-The divergence of $\left(\frac{1}{r^2}\right)$ - The one dimensional and three dimensional Dirac delta function – Applications of Gauss's Law (Why symmetry is crucial – plane symmetry- cylindrical symmetry –spherical symmetry -uniform & non-uniform charge distributions) –The curl of **E.**

Electric potential - comments on potential – Poisson's equation & Laplace equation –The potential of a localized charge distribution – Electrostatic boundary conditions – Work done in moving a charge – The energy of a point charge distribution – The energy of a continuous charge distribution – Comments on electrostatic energy – Basic properties of conductors – induced charges – The force on a surface charge – Capacitors.

(Chapters 1& 2, Book 1)

Module 2: Electrostatic Fields in Matter.

Multipole expansion- approximate potentials at large distances-the monopole and dipole terms-the electric field of a dipole **-**Dielectrics –induced dipoles - Alignment of polar molecules –Polarization - Bound charges – Physical interpretation of bound charges – The field inside a dielectric – Gauss's law in the presence of a dielectric –A deceptive parallel-Boundary conditions-Displacement vector – Linear dielectrics –Susceptibility –permittivity – dielectric constant – Boundary value problems with linear dielectrics – Energy in dielectric systems –Force on dielectrics – Clausius –Mossotti equation.

(Chapters 3 & 4, book 1)

Module 3: Magnetostatics

Magnetic fields- The Lorenz force law – Cyclotron motion –Cycloid motion –- Magnetic force & work -–Line current –Surface current –Volume current- Continuity equation –Steady currents –Biot Savart law— Magnetic field due to(Infinitely long wire –circular coil – solenoid) -The divergence & Curl of **B** – Ampere's law –Applications of Ampere's law – Comparison of magnetostatics & electrostatics –Magnetic vector potential – Magnetostatic boundary conditions –Multipole expansion of vector potential & magnetic dipole moment.

(Chapter 5, book 1)

Book for Study:

1. Introduction to electrodynamics -David .J .Griffiths

Books for Reference:

1. Electromagnetic field theory fundamentals - Bhag Guru & Huseyin Hiziroglu
2. Feynman lectures on Physics Volume II
3. Principles of Physics : Resnick, Halliday , Walker and Jeans

Thermal Physics

Module I: Fundamental concepts

Macroscopic and microscopic point of view, thermal equilibrium- zeroth law-concept of temperature-intensive and extensive parameters - thermodynamic equilibrium - equation of state

(Chapters 1&2, book 1)

Module II: Work, heat and first law of thermodynamics

Concept of work, heat, internal energy, concept of path and state function, first law of thermodynamics- Isothermal process, adiabatic, isochoric and isobaric process. work done in isothermal, adiabatic and isobaric processes- p-v diagrams-equations for isothermal and adiabatic process-first law of Thermodynamics for various process—Kinetic theory of ideal gases-postulates-pressure exerted by gases, kinetic interpretation of temperature, r.m.s speed, internal energy, law of equipartition of energy(no derivation), specific heats of gases, Mayers relation

(Chapters3, 4 & 5, Book 1)

Module III: Heat engines and second law of thermodynmics

Conversion of work into heat and vice-versa, principle of heat engines , cyclic process, Carnot engine and its efficiency, gasoline engine and its efficiency, Diesel engine and its efficiency ,principle of two stroke engine, refrigerator, coefficient of performance, second law of Thermodynamics-Kelvin-Planck and Clausius statements and their equivalence. Reversible and irreversible process- Carnot theorem and its corollary.

(Chapter 6&7 Book 1)

Module IV: Entropy and thermodynamic potentials

Concept of entropy, Second law and entropy, change in entropy in irreversible and reversible process,clausius inequality, entropy of an ideal gas, entropy and disorder, heat death, Temperature-Entropy diagram, T-S diagram of Carnot cycle hence equation for efficiency - Thermodynamic potentials-Internal energy, Enthalpy, Helmholtz free energy, Gibbs function, Maxwells relations, applications of Maxwell equations (1)T ds equations (2) Clausius - Clapeyron equation (3) Joule-Thomson expansion, Joule-Thomson coefficient for ideal and Vander Waal gases.

(Chapters 10 & 11 Book 1)

Module V: Statistical mechanics

Statistical equilibrium-entropy and probability-phase space-Maxwell-Boltzmann distribution-Bose-Einstein distribution-Fermi-Dirac distribution (no derivation)-Fermi level-comparison of this three distribution functions-Black body radiation-Planck radiation law (qualitative idea) Stefan's law

(Chapter 9 Book 2)

Books for study:

1. Heat and Thermodynamics-Mark W Zemansk,Richard H Dittman (seventh Edn.)

2. Concepts of Modern physics-Arthur Beiser (fifth Edn.)

Books for Reference:

1. Heat and thermodynamics-D.S.Mathur

2. Thermodynamics and Statistical physics –BriJ Lal, N.Subrahmanyam and P.S.Hemne (multi colour edn.7)

3. A treatise on heat-Maghanad Saha

4. Thermodynamics, Kinetic Theory, Statistical –Thermodynamics –Francis W.Sears & Gerhard L Salinger.

Classical mechanics & Relativity

Module 1: Relativity

Background of Michelson-Morley Experiment-Inertial and non-inertial frames—Ether hypothesis- Postulates of special relativity—Lorentz transformations—Consequences: length contraction—time Dilation-Simultaneity—Addition of velocities-variation of mass with velocity- relativistic energy: mass – energy relation with examples—electron-positron annihilation-nuclear energy-energy and momentum-transformation of momentum and energy-particles with zero rest mass-binding energy-force in relativistic mechanics.

(Book 1, Ch.3)

Module 2: Linear and Angular momentum

Linear momentum- Conservation of linear momentum –Centre of mass –Velocity of Centre of mass –Centre of mass frame- Centre of mass of thin uniform rod and triangular lamina-collision of two particles-deflection of moving particle by a particle at rest-impact-loss of kinetic energy during impact-Angular momentum and Torque- Conservation of angular momentum- Relation connecting total angular momentum and angular momentum about Centre of mass-Examples of conservation of angular momentum-spin and orbital angular momentum

(Book 1, Ch.6)

Module 3: Potentials and Fields

Central force- Inverse square law force-Superposition principle- Potential energy of a system of charges and masses- Gravitational field and potential-Velocity of Escape-satellite in circular orbit- Electric field and potential- Gravitational potential and field due to i) thin spherical shell ii) Solid sphere- Potential and field due to conducting sphere- gravitational and electrostatic self energy- Kepler's laws with proof

(Book 1, Ch.7)

Module 4: Lagrangian Formulation

Constraints- Holonomic and non Holonomic constraints - Generalized Coordinates- D'Alembert's principle- Lagranges equation. simple examples

(Book 2, Ch.3)

Books for study:

1. Mechanics – J.C.Upadhyaya

2. Mechanics – R.G.Takwale and P.S.Puranik

Books for reference:

1. Classical Mechanics – J.C.Upadhyaya

2. Classical Mechanics -Goldstein

3. Mechanics-D.S.Mathur

4. Concepts of Modern Physics (6^{th} Edn) ----Arthur Beiser –TMH Edn.

Atomic, Nuclear & Particle Physics

Module 1: Atomic Structure

The nuclear atom, Rutherford scattering, electron orbits, atomic spectra, the Bohr atom, energy levels and spectra, correspondence principle, nuclear motion, atomic excitation - Franck-Hertz experiment, spontaneous and stimulated emission processes.

(Book 1, Chapter 4)

Module 2: Many- Electron Atoms

Electron spin, exclusion principle - Stern- Gerlach experiment, periodic table, atomic structures, atomic structure and chemical behaviour, spin-orbit coupling schemes – L-S and J-J coupling, total angular momentum, X-ray spectra.

(Book1, Chapter 7)

Module 3: Nuclear Structure

Nuclear composition, nuclear properties, nuclear stability, nuclear binding energy, liquid drop model, the semi-empirical mass formula, shell model, meson theory of nuclear forces.

(Book1, Chapter 11)

Module 4: Nuclear Transformations

Radioactive decay, half-life, radioactive series, alpha decay, beta decay, gamma decay, scattering cross section, nuclear reactions, nuclear fission, nuclear reactors, nuclear fusion, energy production in stars, fusion reactors.

(Book1, Chapter 12)

Module 5: Elementary Particles

Interaction of charged particles, leptons, hadrons, baryons and mesons, particle quantum numbers, quark structure of hadrons, the eightfold way, fundamental interactions and exchange particles.

(Book1, Chapter 13)

Book for Study:

1.Concepts of Modern Physics - Sixth Edition, Arthur Beiser, Tata McGraw-Hill, New Delhi

Books for Reference:

1. Modern Physics - Kenneth Krane (John Wiley & Sons)
2.Atomic Physics - Christopher J. Foot (Oxford University Press, Cambridge)
3.Nuclear Physics - S N Ghoshal (S Chand and Co.)
4.The Atomic Nucleus - R D Evans (Mc Graw Hill, New York)
5.Modern Physics - G Aruldhas & P Rajagopal (PHI, NewDelhi)
6.Atomic and Nuclear Physics by SSharmahatendra(Pearson)

Electrodynamics-II

Module 1: Magnetostatic Fields in Matter:

Magnetization – Torques and forces on magnetic dipoles –Effect of a magnetic field on atomic orbits –Magnetization –The field of a magnetized object –Bound currents –Physical interpretation of bound currents –The magnetic field inside matter-The auxiliary field H-Amperes law in Magnetized material –Deceptive parallel–Boundary conditions-Linear and Nonlinear Media-magnetic susceptibility and permeability –Ferromagnetism

(Chapter 6, Book 1)

Module 2: Electrodynamics:

Ohm's law - Electromotive force – Motional e.m.f - electromagnetic induction-Induced electric field - Inductance –self inductance and mutual inductance –Inductance of coupled coils – Energy in a magnetic field –Electrodynamics before Maxwell-How Maxwell fixed Ampere's law– Maxwell's equations – 'Magnetic charge' –Maxwell's equations inside matter - -boundary conditions- Conservation laws-Charge and energy-The continuity equation – Poynting's theorem- Newton's third law in electrodynamics – potential formulations of electrodynamics – Scalar & vector potentials- Gauge transformations-Coulomb Gauge and Lorenz Gauge .

(Chapters 7, 8 &10, Book 1)

Module 3: Electromagnetic Waves:

Introduction –The wave equation in one dimension – Sinusoidal waves –Boundary conditions – Reflection and transmission – Polarization - Electromagnetic waves in vacuum-The wave equation for E & B –Monochromatic plane waves –Energy and momentum in electromagnetic waves –Propagation in linear media –Reflection and transmission at normal incidence.

(Chapter 9, Book 1)

Module 4: Applications of Static Fields & Time Varying Electromagnetic Fields:

Deflection of a charged particle –Cathode ray oscilloscope –Electrostatic generator-Electrostatic voltmeter –Magnetic separator –Magnetic deflection –Cyclotron-The velocity selector and mass spectrometer –The Hall Effect –Magneto hydrodynamic generator –An electromagnetic pump – A direct current motor- Applications of electromagnetic fields – The auto transformer -The Betatron.

(Chapters 6&7, Book 2)

Books for study:

1. Introduction to electrodynamics -David .J.Griffiths
2. Electromagnetic field theory fundamentals - Bhag Guru & Huseyin Hiziroglu

Book for Reference:

1. Feynman lectures on Physics: Volume-II.

Photonics & Spectroscopy

Module-1: Lasers: Stimulated absorption-Spontaneous emission-Stimulated emission-Einstein Coefficients-Main components of Laser (1.Active medium 2.Pumping source 3.Optical resonator).Population inversion-cavity life time-Threshold condition-Optical resonator-Line broadening mechanisms (Doppler broadening, Natural Broadening, Collisional Broadening-qualitative ideas) - Laser characteristics - Ruby Laser, He-Ne Laser.

(Book 1)

CO_2 Laser-Dye Laser- Semi-conductor laser-applications of laser

(Book 2)

Module-2: Holography: Introduction - Theory of holography - Requirements for the construction of a good hologram - Applications of holography

(Book 1)

Module-3: Fibre Optics: Introduction-Total internal reflection-The Optical Fiber - Numerical aperture-Attenuation in optical fibres-Single mode and multi mode fibres-Ray dispersion in Optical fibers-Ray dispersion in Step-index Fibers, Parabolic index fibers, Material dispersion-Fiber -optic sensors

(Book 1)

Module-4: Spectroscopy: Regions of the spectrum-Microwave spectroscopy-The rotation of molecules-Rotational spectra-The rigid diatomic molecule-Intensities of spectral lines-The effect of isotopic substitution-The microwave oven

(Book 3)

Module-5: Infrared spectroscopy: The vibrating diatomic molecule-The energy of diatomic molecule-The Simple Harmonic Oscillator - The Anharmonic Oscillator-The diatomic Vibrating Rotator-The vibration-rotation spectrum of carbon monoxide.

(Book 3)

Books for Study:

1. Optics 3rd edition- Ajoy Ghatak,Tata McGraw Hill Publishing Company Ltd.
2. Lasers-Theory and Applications-K.Thyagarajan and A.K.Ghatak,Macmillan India Ltd.
3. Fundamentals of Molecular Spectroscopy-Colin N.Banwell and Elaine M.McCash,Tata McGraw-Hill Publishing Company Ltd.

Books for reference:

1. Laser Fundamentals 2nd edition-William.T.Silfast,Cambridge University Press.
2. Photonics and Lasers - Richard.S.Quimby, John Wiley & Sons(Asia)Pte Ltd.
3. Optical Electronics-Ajoy Ghatak and K.Thyagarajan,Cambridge University Press.

Quantum Mechanics

Module 1: Origin of Quantum Theory

The Limits of Classical Physics-Planck's Quantum Hypothesis- Einstein's theory of Photoelectric effect- Compton Effect- Quantum theory of Specific heat- Bohr atom model of Hydrogen atom- Existence of Stationary states- Wilson Somerfield Quantization rule- Elliptical orbits of hydrogen atom- The harmonic oscillator- Particle in a box- The Correspondence Principle- Inadequacy of quantum Theory

(Book 1 Chapter 1)

Module 2: Wave Mechanical Concepts

Wave nature of particles- The uncertainty Principle- the Principle of Superposition- Wave packet- expectation value- operators- Time dependent Schrodinger equation- interpretation of wave functions- Ehrenfest' theorem.

(Book 1 Chapter 2)

Module 3: Eigen Functions and Eigen Values

Time independent Schrodinger Equation- Stationary states-Admissibility conditions on the wave functions –Eigen Functions and Eigen Values, Postulates of Quantum Mechanics- Simultaneous measurability of observables

(Book 1 Chapters 2 & 3)

Module 4: One dimensional Energy Eigen value problems

Square well potential with rigid walls - Square well potential with finite walls - square potential barrier - tunnel effect - Alpha emission - Scanning tunnelling microscope - Linear Harmonic Oscillator - Schrodinger method - free particle

(Book 1 Chapter 5)

Module 5: Hydrogen Atom

Schrodinger equation for the hydrogen atom, separation of variables, quantum numbers, principal quantum number, orbital quantum number, magnetic quantum number, Zeeman effect, electron spin, exclusion principle, Stern - Gerlach experiment.

(Book 2, Chapters 6 & 7)

Books for study:

1. Quantum Mechanics – G Aruldhas (PHI Learning New Delhi)

2. Concepts of Modern physics – Arthur Beiser (John Wiley & Sons Inc)

Books for reference:

1. Quantum Physics Of Atom, Molecules, Solids, Nuclei & Particles By R.Eisberg &R. Resnick (John Wiley)
2. Quantum physics – Stephen Gasiorowicz (John Wiley & Sons, Inc)
3. Modern Physics – Kenneth S Krane (John Wiley & Sons Inc)
4. Quantum mechanics by B.H.Bransden & C.J.Joachain (Pearson)

Electronics- II

Module 1: AC analysis of BJT circuits and small signal amplifiers
Coupling and bypass capacitors, AC load lines, transistor models, r-parameters, h-parameters, CE circuit analysis, Frequency response - Logarithms, decibels, Bode plot, Single stage CE amplifier, Capacitor coupled and Direct coupled two stage CE amplifiers.

(Book 1, Chapters 6 & 12)

Module 2: Feedback in amplifiers, signal generators and power amplifiers
Types of feedback-Series voltage negative feedback - advantages, Concept of positive feedback, Barkhausen criterion, Phase shift, Hartley, Colpittts and Wien bridge Oscillators, Audio power amplifiers - Transformer coupled Class A, Class B and Class AB amplifiers, Class C tuned amplifier.

(Book 1, Chapters 13, 16 & 19)

Module 3: Operational Amplifiers and its applications
Integrated circuit operational amplifiers, Differential and common mode operation, CMRR, Ideal Operational Amplifier, Op-Amp 741, Voltage follower circuits, Inverting, Non inverting, Summing and Differential amplifier circuits using Op-Amps, Integrator and differentiator circuits using Op-Amps.

(Book 1, Chapter 14)

Module 4: Standard forms of Boolean Expressions
The SOP and POS forms, Conversion of a general expression to SOP and POS, converting standard SOP to POS and vice versa, Boolean Expressions and Truth Tables, Karnaugh Map (up to 4 variables), Karnaugh Map SOP and POS minimization.

(Book 2, Chapter 4)

Module 5: Functions of combinational logic
Basic Adders - Half Adder, Full Adder, Parallel Binary Adder, 4 Bit Parallel Adder, Comparators, decoders, encoders.

(Book 2, Chapter 6)

Books for Study:

1. Electronic Devices and Circuits- 5th Edition, David A Bell (Oxford)
2. Digital Fundamentals- 8th Edition, Thomas L. Floyd (Pearson Education PHI)

Books for Reference:

1. Op-Amps & Linear Integrated Circuits- Ramakant A. Gayakwad (PHI)
2. Electronic Devices and circuit theory - Robert L Boylestad & Louis Nashelsky (PHI)
3. Principles of Electronics - V K Mehta (S Chand & Co.)
4. Electronic Principles - A P Malvino (TMH)
4. The Art of Electronics - Paul Horowitz and Winfield Hill (Cambridge University Press)
5. Digital Principles and Applications - D P Leach and A P Malvino (TMH)