B.Sc. (Hons./Pass/Subs.) Part - I

MECHANICS AND SPECIAL THEORY OF RELATIVITY

Paper Code	:	03PHB/HPS/I
Periods per week	:	2
Maximum Marks	:	50

UnIt 1: Inertial and non-inertial frames of reference. Law of conservation of linear momentum and energy under Ga1ilean Transformation. Non-inertial frames and fictitious forces. Rotating coordinate system and coriolis force. Effects of centrifugal and coriolis forces due to earth's rotation. Conservative and non-conservative forces. Forces as a gradient of potential energy.

UnIt 2: Polar and axial vectors. Rotational quantities as vectors. Vector relation between linear and angular velocities and accelerations. Angular momentum of a system of particles and a rigid body about an arbitrary point and its relation with external torque. Conservation of angular momentum. Moment of inertia and radius of gyration. Theorems of parallel and perpendicular axes. Moment of inertia of bodies of regular shape.

Unit 3: Relation between torque and angular acceleration. Kinetic energy of rotation. Work and Power in rotational motion. Relation between angular velocity and angular momentum. Moment of inertia tensor. Principal axes and principal moment of inertia. Rolling and slipping problems.

Unit 4: Simple harmonic motion of a loaded vertical and horizontal springs, Energy considerations in simple harmonic motion. Angular harmonic motions. Torsional pendulum, Physical pendulum. Simple harmonic motions in two dimensions. Two body harmonic oscillation. Oscillation of a diatomic molecule. Damped oscillations. Forced oscillation and resonance. Width of resonance. Energy dissipation and work done by external forced oscillator problem.

Unit 5: Elastic constants and their mutual relationship. Theory of bending of beams. Bending moment. Cantilever (ineffective weight). Torsion of a cylinder.

Unit 6: Michelson-Morley experiment and its outcome. Postulates of special theory of relativity. Lorentz transformation. Length contraction and time dilation. Relativistic addition of velocities. Velocity dependence of mass. Relation between relativistic momentum and energy. Conservation of relativistic energy.

REFERENCES:

1.	D.S. Mathur	:	Mechanics
2.	J.C. Upadhyaya	:	Mechanics
3.	Resnick & Halliday	:	Physics Part I
4.	R. Resnick	:	Introduction to Special Relativity
5.	Feynman	:	Lectures in Physics Vol. I

B.Sc (Hons./Pass/Subs.) Part I

THERMAL PHYSICS

Paper Code	:	03PHB/HPS/II
Periods per week	:	2
Maximum Marks	:	50

Unit 1:KINETIC THEORY OF GASES (6 Lectures)

Derivation of Maxwell's law of distribution of velocities and its experimental verification. Mean freepath. Transport phenomena, viscosity, conduction and diffusion. Brownian motion.

Unit 2:IDEAL GASES (6 Lectures)

Equation of state, internal energy, specific heats, entropy Isothermal and adiabatic processes.

Unit 3: REAL GASES (8 Lectures)

Deviation from the ideal gas equation. The Virial equation. Andrew's experiments on Coy gas, continuity of liquid and gaseous state. Van der Wall's equation. Critical constants and law of corresponding states. Joule, Thompson effect

Unit 4:THERMODYNAMICS (8 Lectures)

Zeroth and first law of thermodynamics. Reversible and irreversible processes Conservation of heat into work. Carnot theorem. Second law of thermodynamics. Thermodynamic scale of temperature. Clausius inequality. Entropy. Entropy changes in reversible and irreversible processes. Temperature-Entropy diagrams. The principle of increase of entropy.

Unit 5:THERMODYNAMIC FUNCTIONS (8 Lectures)

MaxWell relations and their applications. Magnetic work. Magnetic cooling by adiabatic demagnetization. Approach to absolute zero. Change of phase. Equilibrium between a liquid and its vapour. Clausius- Clapeyron equation. The triple point with examples from Physics. Second order phase transitations.

Unit 6:RADIATION (6 Lectures)

Kirchoffs' law. Black body radiation. Wein's displacement law. Stefans - Boltzlmann law. Planck's law of radiation and qualitative introduction to quanta of radiation.

REFERENCES:

1. M.N. Saha and B.B. Srivastava : A Treastise on Heat

2. Sears & Selinge : Thermodynamics

B.Sc (Hons./Pass/Subs.) Part I

BASIC ELECTRONICS

Paper Code	:	03PHB/HPS/III
Periods per week	:	2
Maximum Marks	:	50

Unit 1 :NETWORK ANALYSIS AND NETWORK THEOREMS (7 Lectures)

Resistance in series and parallel, Star - Delta Transformations, Network, Superposition Theorem, Thevenins Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem : Two Part Network (Z Parameter only), Simple Exercise.

Unit 2 :SEMICONDUCTOR DIODES (8 Lectures)

PN Junction Diode, I-V Characteristics, Static & Dynamic Resistance, zener diode and its application, varactor diode, photodiode, light omitting diode, PN junction diode as a rectifier (half and full wace rectifier), Rectifier efficiency, Ripple factor, Voltage Regulation, Power Supply.

Unit 3 :TRANSISTOR AND AMPLIFIER (8 Lectures)

Bipolar junction transistor, Transistor characteristics, active and saturation regions, Transistor as a switch, Amplifier and their classification, Basic Amplifier : Voltage gain, Current gain, Power gain, Input resistance, Outpur resistance, dicebals, the load line, common emitter amplifier (equivalent hybrid parameter circuit).

Unit 4 :OPERATIONAL AMPLIFIER (6 Lectures)

Principle of OPAMP, differential gain, CMMR, Properties of ideal Operational Amplifiers, Applications of operational Amplifiers : inverting, non-inverting, difference, integration, differentiation, adder.

Unit 5 :OSCILLATORS (6 Lectures)

Basic Principle, Classification of Oscillators, Barkhansen criterion for oscillations, Essectials of Oscillators, Wein-Bridge oscillator, Hartley Oscillator, Colpit oscillator, Clapp-oscillator, (circuit description, working and frequency only).

Unit 6 :MODULATION & DEMODULATION (10 Lectures)

Definitions, Types of modulation, Amplitude Modulation - frequency spectrum, Waveform of amplitude modulated voltage, Percentage of modulation, Amplitude modulator transistor circuits (collector, emitter and base modulators). Demodulation or Detection, Amplitude Demodulation (Diode detector).

REFERENCES :

1. A.P. Malvino	:	Electronic Principle
2. John D. Ryder	:	Fundamental of Electronics
3. Boylestal & Nashelsky	:	Electronic Devices and Circuit Theory
4. Millman & Halkias	:	Electronic Devices and Circuit
5. D.C. Tayal	:	Basic Electronics

B.Sc (Hons./Pass/Subs.) Part II

Electricity and Magnetism

Paper Code	:	03PHB/HPS/IV
Periods per week	:	2
Maximum Marks	:	50

Unit 0: The topics in this unit are to be revised by the students with minimal help from the teacher. No direct question will be asked on these topics but these results will frequently be used in subsequent units.

Mathematical Background: Functions of two and three variables, partial derivatives, geometrical interpretation of partial derivatives of functions of two variables. Total differential of a function of two and three variables, higher order derivatives, repeated integrals of a function of more than one variables, definition of a double and triple integral, evaluation of double and triple integrals, change of variables of integrals, Jacobian.
Scalars and vectors, dot and cross products, triple vector product, gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, line, surface and volume integrals, flux of a vector field, Gauss's divergence theorem, Green's theorem and Stokes Theorem; Curvilnear co-ordinates: spherical polar, cylindical.

Unit 1: (15 lectures)

Electrostatics: Coulombs law in vacuum expressed in vector forms, unit of charge(SI system), Conservation and quantization of charge; Calculation of **E(r)** for simple distributions of charges at rest: monopole, dipole, quadrupole fields. Work done on a charge in an electrostatic field expressed as a line integral, conservative nature of the electrostatic field, electric potential V(**r**) defined as $\mathbf{E(r)} = -\nabla \mathbf{V(r)}$, flux of the electric field, Gauss's law and its application for finding **E (r)** for symmetric charge distributions, Gaussian pillbox, fields at the surface of a conductor, screening of **E(r)** field by a conductor, capacitors, electrostatic field energy, force per unit area on the surface of a conductor in an electric field, induced charges; Point charge in front of a grounded infinite conductor, method of images. Field equations for **E(r)** in vacuum, Energy associated with **E(r**) field. Differential form of Gauss's law $\nabla.\mathbf{E}\ (\mathbf{r}) = 4\pi\rho(\mathbf{r})/\varepsilon_0$, Poisson's equation, Laplace's equation, Solution of Laplace's equation in rectangular, spherical and cylindrical co-ordinates; boundary conditions, Uniqueness theorems.

Unit 2: (10 lectures)

Magnetostatics: magnetic field **B(r)** seen through Lorentz force on a moving charge, unit for **B** defined through force on a straight current, magnetic field due to current: Biot-Savart's law; Field equations in magnetostatics: ∇**.B(r)=0,** Ampere's law ∇**xB(r) =** μ_0**J(r)**, Fields due to a straight wire and a cicular current loop; magnetic dipole, circular current and solenoid.

Unit 3: (8 lectures)

Faraday's law of electromagnetic induction: Integral and differential forms, motional emf, the induced electric field, Betatron; Inductance: mutual and self, transformers, magnetic energy of coupled cicuits, energy in a static magnetic field.

Unit 4 : (12 lectures)

Electrical current and circuits: Steady current, current density **J**, non-steady currents and continuity equation, Varying currents: rise and decay of currents in LR and CR circuits, decay constants, transients in LCR circuits, AC circuit problems: complex impedence and reactance, phasor algebra, series and parallel circuits, resonance, Q factor, power dissipation and power factor, AC bridges.

REFERENCES:

1. D. J. Griffith; 'Introduction to Electrodynamics' (Prentice-Hall of India).
2. A. S. Mahajan and A A Rangwala; 'Electricity and Magnetism' (Tata McGraw-Hill).
3. J. R.Reitz, F.J. Millford and R. W. Christy; Foundations of Electromagnetic Theory' (Narosa Publishing House).
4. Berkeley Physics Course; Electricity and Magnetism, Ed. E.M. Purcell(McGraw-Hill).
5. Halliday and Resnik; 'Physics', Vol.2.

B.Sc (Hons./Pass/Subs.) Part II

OPTICS

Paper Code	:	03PHB/HPS/V
Periods per week	:	2
Maximum Marks	:	50

Unit 1: INTERFERENCE AND INTERFEROMETRY (10 Lectures)

Huygens' Principle. Young's Double Slit Experiment. Coherent Sources. Division of Wave Front-Fresnel's Biprism. Interference in Thin Films. Newton's Rings. Division of Amplitude-Michelson Interferometer. Fabry-Perot Interferometer. Applications of Interferometry for Testing Flatness and Thickness of Films. Interferometric Measurement of Length.

Unit 2: DIFFRACTION (10 Lectures)

Fresnel and Fraunhoffer Diffraction. Fresnel's Half-Period Zones. Fresnel Diffraction at Straight Edge and Circular Aperture. Zone Plate. Fraunhoffer Diffraction at Single, Double and N Slits. Diffraction Gratings. Babinet's Principle. Femlat's Principle.

Unit 3: POLARIZATION (7 Lectures)

Plane, Circular and Elliptical Polarization of Light. Double Refraction. Birefringence. Wave Plates. Glan- Thompson and Nicol Prisms. Dichroic Polarizers. Optical Activity.

Unit 4: RESOLVING POWER OF OPTICAL INSTRUMENTS (4 Lectures)

Rayleigh's Criterion for Resolution. Resolving Power of (Microscope, Telescope, Diffraction Grating and Fabry-Perot Interferometer).

Unit 5: LIGHT SOURCES (4 Lectures)

Classification of Light Sources. Point Source. Extended Source. Blackbody Radiators. Colour Temperature and Brightness Temperature. Line Sources (Neon Lights, Low-Pressure Sodium and Mercury Lamps).

Unit 6: MODERN OPTICS (10 Lectures)

Optical Fibres and their Uses. Basic Ideas about MASERS and LASERS-Population Inversion, Laser Amplification and Oscillation, Construction and working of He-Ne and Ruby Lasers. Applications of Lasers. Holography.

<u>REFERENCES:</u>

1. F.A. Jenkins and H.E. White: Fundamental of Optics 4th Edition. (McGraw Hill, 1976).
2. J.R. Meyer - Arendt : Introduction to Classical and Modern Optics 2nd Edition (Prentice-Hall, 1984).

B.Sc (Hons./Pass/Subs.) Part II

ELEMENTARY QUANTUM MECHANICS

Paper Code	:	03PHB/HPS/VI
Periods per week	:	2
Maximum Marks	:	50

Unit 1: (4 Lectures)

Review of History of Origin of Quantum Mechanics-Plank's Quantum Hypothesis, Photon Nature of Light, de Broglie Waves and Wave- Particle Duality, Heisenberg's Uncertainty Principle.

Unit 2: (8 Lectures)

Linear Operators. Eigen value problem. Eigen value of a Hermition and Unitary Operators. Expectation Values. Commutator bracket and Uncertainty relations.

Unit 3: (8 Lectures)

Postulates of quantum mechanics. Schordinger wave equation. Born's interpretation of wave function.

Unit 4: (12 Lectures)

One dimensional potential well; Infinite square well potential and qualitative discussion of finite square well potential. Barrier penetration. Simple harmonic oscillator. Rigid Rotator.

Unit 5: (10 Lectures)

Spherically symmetric potentials. Angular momentum operator. Eigen values of L and L. Communication Relations. Solution of Hydrogen atom Problem. Degeneracy of Energy levels.

REFERENCES:

1. Beiser : Concepts in Modern Physics
2. Mani Mehta : Modern Physics
3. Schwabble : Quantum Mechanics
4. Ghatak : Quantum Mechanics

B.Sc. (Hons.) Part III

ELECTROMAGNETIC THEORY

Paper Code	:	03PHB/HP/VII
Periods per week	:	3
Maximum Marks	:	75

Unit 1: ELECTROSTATIC FIELDS IN MATTER (10 Lectures)

Polarization. Bound Charges. The field of a polarized object. Field inside a dielectric. The Gauss's law in the presence of dielectrics. (The electric displacement vector D). Susceptibility, permittivity, dielectric constant. Molecular field in a dielectric. Clausius-Mossotti equation. Polar molecules. The Langevin-Debye formula.

Unit 2: MAGNETIC FIELDS IN MATTER (10 Lectures)

Magnetization. Bound Currents. The field of a magnetized object. The magnetic field inside matter. Ampere's law in magnetized materials (The magnetic field intensity vector H). Magnetic Susceptibility and permeability. Energy loss in Hysteresis and B-H curve.

Unit 3: THE ELECTROMAGNETIC FIELD EQUATIONS (14 Lectures)

Maxwell's modification of Ampere's law. Maxwell's equations. Energy and momentum in electromagnetic fields. Electromagnetic potentials. Gauge transformations. Lorentz gauge and Coulumb gauge. Lorentz force in terms of electromagnetic potentials.

Unit 4: ELECTROMAGNETIC WAVES (12 Lectures)

Propagation of plane electromagnetic waves in free space, isotropic dielectrics and conducting media. Energy flux in a plane electromagnetic wave. Skin depth. Joule heating in a good conductor .

Unit 5: REFLECTION AND REFRACTION OF ELECTROMAGNETIC WAVES (12 Lectures)

Boundary conditions for the field vectors E, D, B and H at the interface between two media . Reflection and refraction at the plane interface between two dielectrics. Sne1l's and Fresnel's formulae. The coefficients of reflection and transmission at the interface between two dielectrics. Brewster's angle and polarization. Reflection at the surface of a good conductor.

Unit 6: WAVE GUIDES (8 Lectures)

Propagation of electromagnetic waves between perfectly conducting planes. Waves in Guides of Arbitrary cross-section. Wave Guides of Rectangular Cross-Section. Resonant cavities. DISPERSION: Dispersion in dilute gasses, in liquids and solids.

REFERENCES:

1. Reitz and Milford	:	Foundations of Electromagnetic Theory
2. Feynman	:	Feynman lectures on Physics - II
3. Corson and Lorrain	:	Introduction to Electromagnetic Fields and Waves.
4. Griffiths	:	Electrodynamics

B.Sc. (Hons.) Part III

Nuclear and Particle Physics

Paper Code	:	03PHB/HP/VIII
Periods per week	:	3
Maximum Marks	:	75

UNIT 1: Constituents of the nucleus. The proton-electron hypothesis. The protron-neutron hypothesis. Basic properties. Nuclear size, mass, charge, spin, magnetic moment, electric quadrupole moment, binding energy, packing fraction. BE per nucleon and its observed variation with mass number of the nucleus. Estimation of energy released in nuclear fission and fusion. Nuclear forces. Their salient features. Meson theory of nuclear forces. Modem theory of nuclear forces. Quantum chromodynamics(an introduction only).

UNIT 2: Radioactivity, Radioactive disintegration law. Decay constant, half life and mean life. Successive radioactive transformations. Radioactive equilibrium. Natural radioactive series. Units of radioactivity. Elementary theory of alpha decay. Gamow's explanation. Beta decay. An historic introduction. Difficulties encountered to understand the continuous β-ray spectrum. Pauli's neutrino hypothesis. Electron capture process.

UNIT 3: Nuclear models. The liquid drop model of a nucleus. Weizsacker's semi-empirical mass formula. The shell model of a nucleus. The evidence for shell structure. Magic numbers. Main assumptions of the single particle shell model. The spin -orbit coupling in nuclei. Predictions of shell model.

UNIT 4: Nuclear reactions. Types of nuclear reactions. The balance of mass and energy in nuclear reactions. Q-value. Threshold energy. Compound nucleus model. Excited states of nuclie. Cross section for nulear reactions.

Nuclear energy. Neutron induced fission. Emission of delayed neutrons by fission fragments. Energy released in fission of U-235. Fission chain reaction. Nuclear reactor. Energy production in stars by proton-proton and carbon cycle.

UNIT 5: Fundamental interactions in nature. Classification of elementary particles. Photons, leptons, mesons and baryons. Basic conservation laws. Conservation of lepton number, baryon number, strangeness, isospin. Quark hypothesis. Resonant particles. Cosmic rays. Extensive cosmic ray showers. Effect of earth' s magnetic field on the cosmic ray trajectories. Origin of cosmic rays.

UNIT 6: Accelerators. Need of accelerators. The linear accelerator. The cyclotron. Synchrocyclotron. The betatron and the electron synchrotron. The proton synchrotron.

Detectors of charged particles. Working principle of Cloud chamber and Bubble chamber. Ionisation chamber. Proportional counter . G.M. Counter. Scintillation Counter.

REFERENCES:

1. A. Beiser : Concepts of Modem Physics.

2. T.A. Littlefield and N. Thorley : Atomic and Nuclear Physics(ELBS)

3. R. Eisberg and R. Resnick : Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles (John Wiley)

4. I. Kaplan : Nuclear Physics.

B.Sc. (Hons.) Part III

Atomic and Molecular Physics

Paper Code	:	03PHB/H/IX
Periods per week	:	3
Maximum Marks	:	75

Unit l: Brief review of early models of atomic structure. Hydrogen atom spectrum and the Bohr model. Franck-Hertz experiment. The reduced mass and the discovery of the hydrogen isotopes. Correspondence principle, spectra of hydrogen-like atoms, magnetic moment due to orbital motion, normal Zeeman effect and limits of Bohr Sommerfield theory.

Unit 2: Quantum mechanics applied to the hydrogen atom problem: solution of the Schrodinger equation by separation of variables, eigen values and eigen functions, quantum numbers. Angular contribution to kinetic energy and the angular momentum quantum numbers, Stern-Gerlach experiment and electron spin, spin orbit coupling, Fine structure of the hydrogen atom spectrum.

Unit 3: Many-electron atoms: Hund's rule and the periodic table, spectral terms, doublet structure of alkali spectra. The effective quantum number and quantum defect, penetrating and non-penetrating orbits. Anomalous Zeeman effect, Paschen- Bach effect, Start effect in hydrogen.

Unit 4: Rotational and Vibrational Spectroscopy: diatomic molecule as a rigid rotator, effect of isotopic substitution, non-rigid rotator. Vibrational energy of a molecule, diatomic molecule as a simple harmonic oscillator. The anharmonic rotator, Rotational- Vibrational Spectra, population of energy levels.

Unit 5: Electronic spectra of molecules, dissociation, Frank-Condon principle. Raman effect: Quantum theory of Raman Effect and Raman spectra. Lasers: Brief introduction to the principle of lasers.

REFERENCES:

1. A. Beiser : Concepts in Modern Physics
2. A. Beiser : Perspectives of Modern Physics
3. H.S. Mani & G.K. Mehta : Introduction to Modern Physics, East West Press.
4. G. Herzberg : Molecular Spectra
5. Krane : Modern Physics
6. Eisberg and Resnick : Quantum Physics of Atoms and Molecules.
7. C.N. Banwell : Fundamentals of Molecular Spectroscopy

B.Sc. (Hons.) Part III

ELEMENTRY SOLID STATE PHYSICS

Paper Code	:	03PHB/H/X
Periods per week	:	3
Maximum Marks	:	75

Unit 1: Crystal Structure (6 Lectures)

Crystalline state of solids. Unit cell Bravais lattices. Miller indices. Symmetry elements.

Unit 2: X-rays (12 Lectures)

Continuous and characteristic X-ray spectra. Absorption of X-ray. Diffraction of X-rays. Bragg' s law. Laue' s equations. Powder method. Interatomic forces and the classification of solids.

Unit 3: Elementary Lattice Dynamics (6 Lectures)

Lattice Vibrations. Einstein and Debye theories of specific heat of solids. Debye T law.

Unit 4: Electrical Conductivity (6 Lectures)

Electrical Conductivity of metals and its temperature dependence. Hall Effect.

Unit 5: Elementary Band Theory (10 Lectures)

Free electron theory. Sommerfeld model. Fermi level. Electron in periodic field. Brillouin zones, insulator. Semiconductor and metals.

Unit 6: Defects in Solids (6 Lectures)

Point defects-Frenkel and Schottky vacancies Line defects-Edge and screw dislocations. Planer defects. Stacking faults.

Unit 7: Magnetic Properties of Matter (16 Lectures)

Response of substance to magnetic fields. Dia-, Para- and Ferromagnetic materials. Absence of magnetic charge. Electric current in atoms. Electron spin and magnetic moment Measurement of the susceptibility of paramagnetic substances. Langevin' stheory of dia and paramagnetic substances. Curie-Weiss Law. Theory of ferro-magnetism.

REFERENCES:

1. Charles Kittle	:	Introduction to Solid State Physics.
2. Henry Lipson &	:	Interpretation of X-ray Wooter Photographs
3. Charles S Barrett	:	Structure of Metals
4. Azaroff L. V	:	Introduction to Solids
5. Cochran W	:	The Dynamics of Atoms in Crystals
6. Wahab, M.A.	:	Solid State Physics (Structure and Properties of Materials)

B.Sc. (Hons.) Part III

MATHEMATICAL PHYSICS

Paper Code	:	03PHB/H/XI
Periods per week	:	3
Maximum Marks	:	75

Unit 1 : (15 Lectures)

Complex numbers, Roots of Complex numbers and their argand plots. Sets of points in an argand diagram. Closed and open sets. Simple closed Jordan curve.

Unit 2 : (15 Lectures)

Cauchy-Riemann conditions. Analytic functions. Cauchy's Integral Theorem for simply and multiply connected regions. Cauchy's Integral formula. Cauchy's inequality. Taylor and Laurent Series.

Unit 3 : (15 Lectures)

Singular points. Poles, Liouvilles theorem. Cauchy's Residue theorem. Contour integration and its simple applications. (Problems involving singularities on the real axis are excluded).

Unit 4 : (10 Lectures)

Definition of a linear vector space. Linear independence. Basis Dimension of a linear vector space. Linear transformations and matrices. Addition and multiplication of matrices. Associativity and non-commutativity of product of matrices. Transformation of basis vector.

Unit 5 : (10 Lectures)

Diagonalization of matrices. Definitions of real, orthogonal and symmetric matrices. Definitions of Hermitian and Unitary matrices. Eigen value problem. Cayley-Hamilton Theorem. Introduction to Hilbert Spaces.

Unit 6 : (12 Lectures)

Definition of probability. Sample space. Theorem of total and compound probability. Expectation value. Central Limit Theorem of Probability Theorem. Simulation of random Variables. .

<u>REFERENCES:</u>

1. Sokolnikoff and Redheffer : Mathematics of Physics and Modern Engineering

2. Pipes and Harwill	:	Mathematics of Engineers and Physicists
3. Charlie Harper	:	Introduction to Mathematical Physics
4. Potter & Goldberb	:	Mathematical Methods
5. Dennery & Krzywicki	:	Mathematical Physics
6. Tulsi Dass & R.K. Sharma	:	Mathematical Physics

B.Sc. (Hons.) Part III

ADVANCED ELECTRONICS

Paper Code	:	03PHB/H/XII
Periods per week	:	3
Maximum Marks	:	75

Unit 1: NUMBER SYSTEMS (4 Lectures)
Introduction to decimal, binary, octal, hexadecimal number system. Inter conversion of binary decimal. BCD, octal and hex. Parity, grey and Johnson code. Simple binary arithmetic. 2p' s complement.

Unit 2: LOGIC GATES (6 Lectures)
Positive and negative logic, Different logic gates such as AND, OR, NOT, NOR, NAND, EXOR. EXNOR. Symbols and truth tables. Introduction to different logic families (RTL, DTL, TTL, ECL, C-MOS) merits and demerits.

Unit 3: CASE STUDY (6 Lectures)
TTL NAND Gate. Multi-emitter input transistor, Totempole and open collector output concepts. Basic concepts of Fan-in and Fan-out, sinking and sourcing of current.

Unit 4: BOOLEAN ALGEBRA AND COMBINATIONAL LOGIC (12 Lectures)

Boolean axioms, D' morgan' s Theorem: Statement verification and applications. Simple combinational logic implementations. Karnaugh mapping up to four variables. Half adder, full adder and substractors, simple combinational logic circuit design.

Unit 5: SEQUENTIAL LOGIC (8 Lectures)

Different types of flip-flops such as RS, Clocked RS, J-K, Master Slave J- K, D-type and T-type flip flops.

Unit 6: COUNTERS (10 Lectures)

Asynchoronus and Synchoronus counters (up and down), Modulo ' N' counter. Concept of counter as frequency divider, BCD counters.

Unit 7: SHIFT REGISTERS (6 Lectures)
Different types of shift register (Right & Left), Serial and parallel loading, ring counter and its application.

Unit 8: DATA ROUTING ELEMENTS (4 Lectures)

Multiplexer, Demultiplexer, Decoder, Encoder, Tristale Buffer.

Unit 9: Display and Display drivers (4 Lectures)

REFERENCES:

1. Digital Electronics by Malvino & Leach.
2. Digital Principle and Applications by Malvino and Leach.
3. Digital Computer Electronics and Introduction to Micro-computers by A.P. Malvino.
4. Digital Electronics by Moris Mano. (TMH)
5. Digital Electronics by V.K. Jain (TMH).