



# M.Sc. Physics First Year Syllabus

## Semester I

### Mathematical Physics Code MPH 101

#### Unit -1

**Matrices:** Definitions and types of matrices; Solution of linear algebraic equations; Characteristic equation and diagonal form; Eigen values and Eigen vectors; Cayley - Hamilton theorem; Functions of matrices; Application in solving linear differential equation.

#### Unit -2

**Differential Equation:** Linear Differential equation of first order; Linear differential equations with constant coefficient; Summary of Frobenius method, Exact equation, Inhomogenous linear equation, Differential equation with exact solution.

#### Unit-3

**Complex Analysis:** Function of complex variables; Cauchy-Riemann differential equations; Cauchy's integral theorem, Cauchy's integral formula; Taylor's Series, Laurent series; Cauchy residue theorem; Singular points of an analytical function; Evaluation of residues & definite integrals.

#### Unit- 4

**Special Functions Differential Equations:** Differential Equations and Special Functions, Beta and Gamma functions; Second ordered linear differential equations with variable coefficients; Solution of Hyper-geometric, Legendre, Bessel, Hermite and Laguerre equations; Physical applications; Generating functions; Recursion relations.

#### Unit-5

**Fourier series and Transforms:** Fourier series; Fourier integrals and transform; FT of Delta functions; Convolution theorem; Parseval's identity; Applications to the solution of differential equations, Laplace Transform and its properties; Applications to the solution of differential equations



### Text Books:

1. Artken & Weber, *Mathematical methods for Physicist*, Academic Press- N.Y.
2. E. Kreyszig, 7th Edition, *Advanced Engineering Mathematics*, New Age International.

### Reference Books:

1. J.W. Brown, R.V .Churchill, *Complex Variables and Applications*, Mc-Graw Hill.
2. A. W. Joshi, *Matrices and Tensors in Physics*, New Age International.

## Classical Mechanics Code MPH 102

### Unit-1

**Preliminaries of classical mechanics:** Newtonian mechanics - one and many particle systems; Conservation laws; Work energy theorem; Open system (with variable system) constraints and their classification; D'Alembert principle; Generalized coordinates.

### Unit-2

**Central Forces:** Reduction to one body problem; equation of motion and first integral; one dimensional problem and classification of orbits; Kepler's laws and planetary motion; Scattering in central force field; Transformation to laboratory frames.

### Unit-3

**Rigid Body and Vibrating System:** Euler angles; Tensor of inertia; Kinetic energy of a rotating body; Symmetric top and Applications; Vibrating string; Solution wave equation; Normal vibrations; Dispersion; Coupled vibrating system.

### Unit-4

**Hamiltonian Formulation:** Legendre transformation; Hamiltonian equation of motion; cyclic coordinates; Phase space and Liouville's theorem; Poisson bracket.

### Unit-5

**Special Theory of Relativity:** Inertial and Non- inertial Frames, Michelson-Morley Experiment, Postulates of Special Theory of Relativity, Galilean and Lorentz Transformation, Length Contraction and Time Dilation, Addition of Velocities, Mass Energy Equivalence and Variation of Mass with Velocity.



### Text Books:

1. N. C Rana & P S Joag, *Classical Mechanics* by, TMH.
2. H. Goldstein, *Classical Mechanics*, Narosa Publishing Home.

### Reference Books:

1. P.V. Panat, *Classical Mechanics*, Narosa Publishing Home.
2. R. G. Takawale and P.S.Puranik, *Introduction to Classical Mechanics*, TMH
3. J. C. Upadhyaya, *Classical Mechanics*, Himalaya Publishing House.

## Quantum Mechanics Code MPH 103

### Unit –1

**Schrödinger Equation:** Empirical basis; de-Broglie hypothesis of matter waves; Heisenberg's uncertainty relation; Schrödinger's wave equation; Physical interpretation and conditions on wave function; Eigenvalues and Eigen-functions; Particle in a square-well potential; Tunneling through a barrier.

### Unit –2

**Operators and Eigen-functions:** Linear operator; Orthogonal systems and Hilbert space ; Expansion in Eigen-functions; Hermitian operators; Fundamental commutation rule; Commutations and uncertainty principle; state with minimum uncertainty.

### Unit –3

**Solvable Problems:** Harmonic oscillator; Operator method; Schrödinger equation for spherically symmetric potentials; Angular momentum operator; condition on solutions and Eigen-values; Spherical harmonics; Rigid rotor; Radial equation of central potential; Hydrogen atom; Degenerate states

### Unit – 4

**Angular Momentum and Spin:** Eigen-values of angular momentum  $\mathbf{J}$ , Matrix representation of  $\mathbf{J}$ ; electron spin; Zeeman effect; Addition of angular momentum; Clebsch- Gordan coefficients; Identical particles with spin

### Unit – 5



**Scattering Theory and Approximation Methods:** Scattering cross-section; Born Approximation; partial wave analysis; Differential and total cross, sections; phase shifts; exactly soluble problems; Mutual scattering of two particles; Perturbation theory and variation method

**Text Books:**

1. P.M.Mathews and K.Venkatesan, *A Text-book of Quantum Mechanics*, Tata McGraw-Hill.
2. A.Ghatak and S.Lokanathan, *Quantum mechanics: Theory and Applications*, Kluwer Academic Press.

**Reference Books:**

1. Li boff, *Introductory Quantum Mechanics*, Pearson Education Ltd.
2. R.P. Feynman, *Feynman Lectures on Physics (Volume 3)*, Narosa.
3. J.J. Sakurai, *Modern Quantum Mechanics*, Addison-Wesley.

**Electromagnetic Theory  
Code MPH 104**

**Unit –1**

**Electrostatics:** Differential equation for electric field; Gauss's law; Poisson and Laplace equations; formal solution for potential with Green's functions; examples of image method; Solutions of Laplace equation in cylindrical and spherical coordinates by orthogonal functions; Dielectrics, polarization of a medium, electrostatic energy; Boundary value problems;.

**Unit –2**

**Magneto-statics:** Magnetic Induction, Biot - Savart law, Ampere's law and applications; Magnetic flux; Magnetization; Magnetic intensity, energy density; Linear and nonlinear media.

**Unit –3**

**Maxwell's Equations:** Displacement current; Maxwell's equations; Boundary conditions on the fields at interfaces; Vector and scalar potentials; Electromagnetic energy and momentum; Conservation laws; Inhomogeneous wave equation and Green's function solution.

**Unit –4**

**Electromagnetic Waves:** Electromagnetic wave equation; Solution and propagation of monochromatic waves in nonconducting media; Polarization and energy density; Reflection and transmission at oblique incidence; Waves in conducting media; Wave guides, TE, TM and TEM waves in rectangular wave guide.



## Unit –5

**Radiation:** Field and radiation in dipole; Radiation by moving charges; Lienard-Wiechert potentials; Total power radiated by an accelerated charge; Lorentz formula; application to antenna; Types of antennas.

### Text Books:

1. J.D. Jackson, *Classical Electrodynamics*, John Wiley & Sons.
2. D. J. Griffiths, *Introduction to Electrodynamics*, Prentice Hall of India.

### Reference Books:

1. F.J. Milford and R.W. Christy, *Foundations of Electromagnetic Theory*, Narosa publishing house.
2. E.C. Jordan and K.G. Balmain, *Electromagnetic Waves and Radiating Systems*, Prentice-Hall of India.

## Thermodynamics & Statistical Physics Code MPH 105

### Unit –1

**Elementary Probability Theory:** Binomial; Poisson and Gaussian distributions; Central limit theorem.

### Unit – 2

**Ensembles: Review of Thermodynamics:** Extensive and intensive variables; Laws of thermodynamics; Legendre transformations and thermodynamic potentials; Maxwell relations; Applications of thermodynamics to (a) ideal gas; (b) magnetic material and (c) dielectric material.

### Unit – 3

**Formalism of Equilibrium: Statistical Mechanics:** Concept of phase space; Liouville's theorem; Basic postulates of statistical mechanics; Ensembles: microcanonical, canonical, grand canonical and isobaric; Connection to thermodynamics; Fluctuations; Applications of various ensembles; equation of state for a non-ideal gas; Van der Waals' equation of state; Meyer cluster expansion; virial coefficients.

### Unit – 4



**Fermi-Dirac Statistics:** Fermi-Dirac, Ideal Fermi gas, properties of simple metals, Pauli paramagnetism, electronic specific heat, and white dwarf stars.

### **Unit--5:**

**Bose-Einstein Statistics:** Bose-Einstein statistics; Applications of the formalism to: Ideal Bose gas; Debye theory of specific heat, properties of black-body radiation, Bose- Einstein condensation, experiments on atomic BEC, BEC in a harmonic potential.

#### **Text Books:**

- 1.F. Reif, *Fundamentals of Statistical and Thermal Physics*, Tata McGraw-Hill.
- 2.F.Reif, *Fundamentals of Statistical and Thermal Physics*, McGraw – Hill.

#### **Reference Books:**

1. B.B.Laud, *Fundamentals of Statistical Mechanics*, New Age International Publication.
2. Lokanathan and Gambhir, *Statistical and Thermal Physics*, Prentice Hall of India Ltd.

## **Industrial Management Code MPH 106**

### **Unit-1**

**General Management:** Principles of scientific management; Brief description of managerial functions

**Business Organizations:** Salient features of sole Proprietorship, Partnership, Joint stock Company – private and public limited.

### **Unit -2**

**Financial Management:** Concept of interest; Compound interest; Present worth method, Future worth method, Depreciation – purpose, Types of Depreciation; Common methods of depreciation - Straight line method, Declining balance method, Sum of the years digits method.

### **Unit -3**

**Personnel Management:** Leadership and motivation; Staff role of the personnel department; Personnel functions; Organizational structure.

**Human Resource Planning:** Reasons for human resource planning; Planning process; Goals and plans of the organizations; Implementation programs; Brief description of recruitment, selection, placement, performance appraisal, career development, promotion, transfer, retirement, training and development, motivation and compensation.



## Unit -4

**Material Management:** Importance; Definition; Source selection, Vendor rating and Value analysis; Scope of MRP. Inventory Control: Definition, objectives, reasons, and requirements for inventory management; Inventory methods - ABC Analysis, VED. Economic Order Quantity models - Basic EOQ, Economic production run size and Quantity discounts.

## Unit -5

**Marketing Management:** Product life cycle; Channels of distribution; Advertising & sales promotion, Market Research

**Managing Marketing Effort:** Marketing implementation and evaluation; Appraisal and prospects

### Text books:

1. K. K. Ahuja, *Industrial Management*, Vol. I & II, Khanna Publisher.
2. E.Paul Degarmo, John R.Chanda, William G.Sullivan, *Engg Economy*, Mac Millan Publishing Co.

### Reference Books:

1. Philip Kotler, *Principles of Marketing Management*, Prentice Hall.
2. P. Gopalakrishnan, M. Sundaresan, *Materials Management*, Prentice Hall of India Ltd.

## Physics Lab I Code MPH 107

### List of Experiments

**Note: Minimum 10 experiments should be performed**

1. Study of Non-Destructive Testing using Ultrasonics.
2. Measurement of resistivity of sheets/films of polymer by Two Probe Method.
3. Study of Op-Amp as Square and Ramp Generator.
4. Find the Susceptibility of given paramagnetic substances ( $\text{FeCl}_3$ ) by Quincke's Method.
5. Study of Curie Temperature of Magnetic Materials (Iron).
6. Study of carrier density, mobility and Hall Coefficient of semiconductor using Hall's experiment.
7. Study of the elastic constants of glass by Cornu's interference methods – Elliptical and Hyperbolic Fringes
8. To trace I-V characteristic curves of diodes and transistors on a CRO, and learn their uses in electronic circuits
9. Determination of solar constant of a solar cell.
10. To study the Fibre attenuation of a given optical fibre.



11. Study of Band gap energy of a Thermister.
12. Determination of Stefan's constant.
13. MATLAB – Matrix operations.
14. MATLAB: Digital Signal Processing
15. MATLAB: Solving Ordinary Differential Equation.

#### Reference Books:

1. Experimental Physics: Modern Methods, R.A. Dunlap, Oxford University Press.
2. B.K. Jones, Electronics for Experimentation and Research, Prentice-Hall.
3. Basic Electronics: A Text-Lab Manual, P.B. Zbar and A.P. Malvino, Tata Mc-Graw Hill, New Delhi.

## M.Sc. Physics Ist Year Syllabus

### Semester II

#### Solid State Physics Code MPH 201

#### Unit – 1

**Crystal Structure:** Bravais lattices; Crystal systems; Point groups, space groups and typical structures; Reciprocal Lattice, Planes and directions; Point, line, surface and volume defects; Ionic crystals: Born Mayer potential; Thermo-chemical Born-Haber cycle; Van der Waals binding; Rare gas crystals and binding energies; Covalent and metallic binding: characteristic features and examples.

#### Unit – 2

**Crystal Diffraction and Lattice Vibrations:** X-rays; Bragg's law in direct and reciprocal lattice; Structure factor; diffraction techniques; Lattice dynamics: mono-atomic and diatomic lattices; Quantization of lattice vibrations; Phonon momentum; Inelastic scattering by phonons; Debye's theory of lattice heat capacity; Einstein's model and Debye's model of specific heat; thermal expansion; Thermal conductivity.

#### Unit – 3

**Theory of Conductors and Semiconductors:** Free electron theory of metals; Electron Heat Capacity; Bloch functions; Formation of energy bands; Kronig -Penny Model; Brillouin zone; Effective mass; Concept of Holes; Fermi surface; Drude model of electrical and thermal conductivity.





**Semiconductors:** Carrier statistics in intrinsic and extrinsic crystals; Electrical conductivity; Hall Effect Electronic specific heat.

#### **Unit – 4: Superconductivity:**

Concept of superconductivity; Meissner effect; Type I and type II superconductors; London equations; Penetration depth; Coherence length; Super-conductivity ground state; BCS theory; Flux quantization in a ring; Electron tunneling; DC & AC Josephson Effect; Macroscopic quantum interference; SQUID; Introduction to high temperature superconductors.

#### **Unit – 5:**

**Magnetic: Magnetic materials:** Types, Quantum theories of dia- and para- magnetism; *Susceptibility measurement:* Guoy Balance, Quincke's method; Hysteresis; Domain theory – Ferri, Ferro and antiferromagnetic order; Curie temperature and Neel Temperature.

#### **Text Books:**

1. Charles Kittel, *Introduction to Solid State Physics*, Wiley Eastern.
2. A.J. Dekker, *Solid State Physics*, Prentice Hall of India.

#### **Reference Books:**

1. Ali Omar, *Elementary Solid State Physics*, Narosa Publishing House.
2. J.S. Blakemore, *Solid State Physics*, Cambridge University Press.
3. S.O. Pillai, *Problems and Solutions in Solid State Physics*, New Age International .

## **Atomic & Molecular Physics** **Code MPH**

#### **Unit – 1**

**Atomic Spectra:** Quantum states of Electron in atoms; Hydrogen atom spectrum; Electron spin; Spin Orbit interaction; Lande interval rule; Two electron systems; LS – JJ coupling Schemes; Fine structure; Spectroscopic terms and selection rules; Hyperfine structure; Isotopic shift; Width of spectral lines; Exchange symmetry of wave function; Pauli's exclusion principle; Spectrum of Helium and Alkali atom.

#### **Unit – 2**

**Atoms in External Fields and Resonance Spectroscopy:** Zeeman and Paschen Back Effect of one and two electron systems; Stark effect; X-ray – Auger transitions; Compton Effect; NMR – Basic principles; Classical and Quantum mechanical description; Magnetic dipole coupling;



Chemical shift; Knight shift; ESR – Basic principles; Nuclear interaction and Hyperfine Structure; g-factor; Zero field splitting

### Unit –3

**Microwave Spectroscopy and IR Spectroscopy:** Rotational spectra of diatomic molecules; Rigid rotator - Effect of isotropic substitution; Non rigid rotator – Rotation spectra of polyatomic molecules; Linear, symmetric top and asymmetric top molecules; Experimental Techniques; Diatomic vibrating rotator; Linear, Symmetric top molecule; Analysis by infrared techniques.

### Unit – 4

**Raman Spectroscopy:** Raman Effect; Quantum theory of Raman effect; Electronic, rotational, vibrational and Raman spectra of diatomic molecules; Raman spectra of polyatomic molecules; Raman Spectrometer; Hyper Raman effect; Experimental techniques.

### Unit – 5

**Electronic Spectroscopy:** Electronic spectra of diatomic molecules; Frank-Condon principle; Dissociation energy and dissociation products; Rotational fine structure of electronic vibration transitions; Fortrat Diagram; Pre-dissociation

#### Text Books:

1. G M Barrow, *Introduction to molecular spectroscopy*, Tata McGraw Hill.
2. Arthur Beiser, *Concepts of Modern Physics*, McGraw Hill.

#### Reference Books:

1. Manas Chanda, *Atomic Structure and Chemical Bond*, Tata McGraw Hill.
2. G .Aruldas, *Molecular Structure and Spectroscopy*, Prentice Hall of India Ltd.

## Nuclear & Particle Physics Code MPH 203

### Unit-1

#### Basic Nuclear Properties and Forces:

Basic nuclear properties: Size, Shape and charge distribution, Spin and parity; Binding energy, semi-empirical mass formula, liquid drop model; Nature of the nuclear force; form of



nucleon-nucleon potential; Charge independence and charge-symmetry of nuclear forces; Deuteron problem.

## Unit-2

**Nuclear Models:** The Semi empirical mass formula; Evidence of shell structure; Single-particle shell model, its validity and limitations; Rotational spectra; Magnetic moments and Schmidt lines; Iso-spins

## Unit-3

**Nuclear Decay:** Decay-range; Particle spectra; Gamow theory; Beta decay; Fermi decay of beta decay; Shape of the beta spectrum; Total decay rate; Angular momentum and parity selection rules; Parity violation; Detection and properties of neutrino; Application of radiation theory to multipole transitions in nuclei; Angular momentum and parity selection rules; Internal conversion; Nuclear isomerism.

## Unit-4:

**Nuclear Reactions:** Reaction dynamics; The Q equation; Theory of Nuclear reaction; Partial wave analysis; Compound nucleus formations and break up; Resonance scattering and reactions; The Optical model Theory of stripping reactions; The Fission process; Neutron released in the fission process.

## Unit-5

**Elementary Particle Physics:** Types of interaction between elementary particles; Hadrons and leptons; Symmetry and conservation laws; Elementary ideas of CP and CPT invariance; Classification of hadrons quark model SU(2) SU(3) multiplets; Gell-Mann-Okubo mass formula for octet, decuplet hadrons.

### Text Books:

1. R.R. Roy and B.P. Nigam, *Nuclear Physics*, New Age International.

### Reference Books:

1. Kaplan, *Nuclear Physics*, Narosa.
2. B.L. Cohen, *Concepts of Nuclear Physics*, Tata McGraw Hill.



# Nano-Science and Technology

## Code MPH 204

### Unit- 1

**Introduction to Nanoparticles:** Introduction; Historical perspective of nanoparticle; Classification of nanomaterials - Nanorods, Nanoparticle; Nanomaterial preparation - Plasma Arching, Chemical Vapor Deposition, Sol Gel electrode position, Ball Milling technique.

### Unit – 2

**Characterization Tools:** Electron Microscopy Techniques – SEM, TEM; X ray methods; Optical Methods Fluorescence Microscopy; Atomic Force Microscopy; STM.

### Unit – 3

**Nanomagnetism:** Mesoscopic magnetism; Magnetic measurements: Miniature Hall Detectors; Integrated DC SQUID Microsusceptometry; Magnetic recording technology; Biological Magnets.

### Unit – 4

**Nanoelectronics and Integrated Systems:** Basics of nanoelectronics; Single Electron Transistor; Quantum Computation; Tools of micro nanofabrication; Nanolithography; Quantum electronic devices; MEMS and NEMS; Dynamics of NEMS; Limits of integrated electronics.

### Unit- 5

**Applications:** Micromechanical systems; Robots; Ageless materials; Nanomechanics; Nano electronics; Optoelectronic devices; LED; Colourants and pigments; Nano biotechnology - DNA chips, DNA array devices, Drug delivery systems.

#### Text Books:

1. Jan Korvink & Andreas Greiner, *Semiconductors for Micro and Nanotechnology – an Introduction for Engineers*, Weinheim Cambridge: Wiley.
2. Sunita Singh, *Nano Science*, Dhanpat Rai & Co.

#### Reference Books:

1. N John Dinardo, *Nanoscale Characterisation of Surfaces & Interfaces*, Weinheim Cambridge, 2nd edition, Wiley-VCH.
3. G Timp (ed), *Nanotechnology*, AIP press, Springer.



4. M. Wilson, K. Kannangara, G. Smith, M. Simmons and B. Raguse, *Nanotechnology: Basic Sciences and Energy Technologies*, Overseas Press.

## **Electronics Code MPH 205**

### **Unit – 1**

**Network Analysis:** Kirchoff's laws; Thevenin & Norton theorems; Superposition; Reciprocity; Compensation theorems; Source transformation; Delta and Star transformations; Laplace Transformation; Convolution integral.

### **Unit – 2**

**Semiconductor Devices:** Basic principles of transistor operation; Biasing; Characteristics of BJT and JFET; MOSFET: Enhancement and depletion modes of operation.

### **Unit – 3**

**Amplifiers and Oscillators:** Low frequency and high frequency and Power amplifiers using transistors; Sine wave generators; Wien bridge and phase shift oscillators; Multivibrator circuits; Triangle and square wave generation; NE 555 timer and applications.

### **Unit – 4**

**Operational Amplifiers:** Ideal operational amplifier: Characteristics; Feedback types; Applications: Basic scaling circuits, current to voltage and voltage to current conversion; Sum and difference amplifiers; Integrating and differentiating circuits; A.C. Amplifiers; Filters.

### **Unit – 5**

**Digital Circuits:** Logic gates; Half adder; Full adder; Comparators; Decoders; Multiplexers; Demultiplexers; Design of combinational circuits; Sequential circuits; Flip Flops; Counters; Registers; A/D and D/A conversion characteristics.

### **Text Books:**

1. Milman J. and Halkias C.C., *Electronic Devices and Circuits*, Tata McGraw Hill.

### **Reference Books:**



1. *Electronics with Digital and Analogue Integrated Circuits*, Tata McGraw Hill.
2. Malvino A.P., *Electronics: Principles and Applications*, Tata McGraw Hill.

## **Organization Behavior Code MPH 206**

### **Unit –1**

Concept, Nature, Characteristics, Models of Organizational Behavior, Management Challenge, Organizational Goal, Global challenges and Impact of culture

### **Unit –2**

**Perception:** Concept, Nature, Process, Importance. Attitudes and Workforce Diversity

**Personality:** Concept, Nature, Types and Theories of Personality Shaping, Learning: Concept and Theories of Learning.

### **Unit –3**

**Motivation:** Concepts and Their Application, Principles, Theories, Motivating a Diverse Workforce.

**Leadership:** Concept, Function, Style and Theories of Leadership-Trait, Behavioral and Situational Theories, Analysis of Interpersonal Relationship

### **Unit – 4**

**Organizational Power and Politics:** Concept, Sources of Power, Approaches to Power, Political Implications of Power, Knowledge Management & Emotional Intelligence in Contemporary Business Organization.

**Organizational Change:** Concept, Nature, Resistance to change, Managing resistance to change, Implementing Change

### **Unit –5**

**Conflict:** Concept, Sources, Types, Functionality and Dysfunctional of Conflict, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organizational, Resolution of Conflict, Stress: Understanding Stress and Its Consequences, Causes of Stress, Managing Stress.

### **Text Books:**

1. Dwivedi, D. N, *Managerial Economics*, Vikas Publishing House.
2. Varshney & Maheshwari, *Managerial Economics*, Sultan Chand & Sons.



### Reference Books:

1. Robbins Stephen P., *Organizational Behavior* Pearson Education
2. Hersey Paul, “*Management of Organizational Behavior: Leading Human Resources*” Blanchard, Kenneth H and Johnson Dewey E., Pearson Education
3. Khanka S. S. “*Organizational Behavior*”

## Physics Lab II

### Course Code MPH 207

### List of Experiments

#### Note: Minimum 10 experiments should be performed

1. To determine the wavelength, separation of wavelengths of sodium light and to determine the thickness of thin mica sheet using Michelson interferometer.
2. To determine the resistivity of Ge at various temperatures by four-Probe method.
3. Study of Susceptibility of paramagnetic material by Gouy method.
4. Study of Ionic Conductivity of solids like NaCl.
5. Study of skin depth in Al using electromagnetic radiation.
6. Study of- Characteristics, inverse square law, absorption coefficient by using GM Counter.
7. Study of End point energy using GM tube.
8. Study of Electron Spin Resonance (ESR).
9. Calculate the wavelength of the green and dark blue line of the cadmium lamp using Fabry - Perot Etalon.
10. To demonstrate the wave nature of the electron by Electron Diffraction.
11. Study of Thermionic Emission.
12. Study of the existence of atomic energy levels using Franck – Hertz Experiment.
13. Study of Zeeman Effect.
14. Determination of „e” by Millikan oil drop method.
15. To determine the molecular field in a dielectric and verify Clausius – Mossotti equation.
16. Study of absorption spectra of Iodine molecule and to determine its dissociation energy using spectrometer.

### Reference Books:

1. G.Aruldas, *Molecular structure and Spectroscopy*, Prentice-hall of India Pvt. Ltd.
2. S.P. Pillai (3 rd Edition), *Solid State Physics*, New age International Publisher.
3. D.R. Behekar, Dr. S. T. Seman, V.M. Gokhale, P.G .Kale, *Practical Physics*, ( Kitab Mahal Publication)