Physics Sikkim Manipal University

Details of UG courses & Syllabus
(B. Sc. Three year course, Semester system)

Marks Distribution

Theory : External =80, Internal assessment =20 (80+20= 100) each paper
Practical: (40+ 10=50) each semester , 40 marks Practical + 10 Internal

B Sc I Year

Semester I:

Paper I: Mechanics and Properties of Matter
Paper II: Electricity and Magnetism
Lab Course: Practical

Semester II:

Paper I: Waves And Oscillations
Paper II: Optics
Lab Course: Practical

B Sc II Year

Semester III:

Paper I: Heat and Thermodynamics
Paper II: Solid state physics and Statistical Mechanics
Lab Course: Practical

Semester IV:

Paper I: Elements of Modern Physics
Paper II: Basic Electrical and Electronic circuits
Lab Course: Practical

B Sc III Year

Semester V:

Paper I: Electronics and Solid State Devices
Paper II: Mathematical Physics
Lab Course: Practical

Semester VI:

Paper I: Quantum Mechanics
Paper II: Digital and optoelectronics
Lab Course: Practical

B. Sc. Syllabus
Semester I:

Paper I: Mechanics and Properties of Matter

Laws of Motion and conservation laws: Frames of reference, Newton's Laws of motion, Work and energy, uniform circular motion, Conservation of energy and momentum. Conservative and non conservative forces, Motion of rocket, Motion of a particle in a central force field, Keplers laws of planetary motion, Newton's Law of Gravitation, Gravitational field, potential and potential energy, Gravitational potential and field intensity for spherical shell. Satellite, Basic idea of global positioning system (GPS).

Rotational Motion: Dynamics of a system of particles, Centre of mass, Angular velocity and momentum, Torque, Conservation of angular momentum, Equation of motion, Moment of inertia, theorem of parallel and perpendicular axis, moment of inertia of rod, rectangular lamina, disc, solid sphere, spherical shell, kinetic energy of rotation, rolling along a slope.

Fluids: Surface Tension and surface energy, Excess pressure across surface: application to spherical drops and bubbles, variation of surface tension with temperature - Jaegar's method. Viscosity: Flow of liquid, equation of continuity, energy of fluid, Bernoulli's theorem, Poiseuille's equation and method to determine coefficient of viscosity, Variations of viscosity of a liquid with temperature

Elasticity: Hooke's law, Stress –strain, Elastic potential energy, Elastic moduli: Young's, Bulk and shear modulus of rigidity, Poisson's ratio, relation between elastic constants Work done in stretching and in twisting a wire, Twisting couple on a cylinder, Strain energy in twisted cylinder, Determination of Rigidity modulus by statical and dynamical method (Barton's and Maxwell's needle), Torsional pendulum, Young's modulus by bending of beam, Determination of Y, η and σ and moment of inertia by Searle's method.

Reference Books:

1. Mechanics Berkeley Physics course,vol.1:Charles Kittel, et. Al. 2007, Tata McGraw-Hill.
2. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley
3. Mechanics: Mathur, and Hemnek, S Chand Publications
4. Mechanics: J.C.Upadyaya, Ram Prasad and Sons, Agra.
5. Mechanics and General Properties of Matter:P.K.Chakraborthy, Books and Allied Pvt. Ltd
6. Elements of mechanics, Prakash & agrawal, Pragati .Prakashan Meerut

Paper II : Electricity and Magnetism

Vector field and Electrostatics: Scalar and Vector field, gradient, divergence, Curl. Line, surface and volume integrals of Vector fields, Gauss-divergence and Stoke's theorems, Electrostatic Field electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field and potential due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, Electric potential as line integral of electric field, electric dipole, uniformly charged spherical shell and solid sphere. Capacitance of an isolated spherical conductor, Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarization, Parallel plate capacitor filled with dielectric.

Magnetostatics: Lorentz force, Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law.Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.

Electromagnetic Induction and Alternating current: Field due to Helmhotz coil, solenoid and current loop, Ballastic galvanometer, Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, Mutual inductance of coil system Energy stored in magnetic field, Alternating currents, Alternating voltage across R-C, L-C, and R-L and LCR circuits, condition of resonance.

Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Reference Books:

1. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
2. Electricity and magnetism, Satyaprakash, Pragati prakashan , Meerut.

Practical List: (Any 12 of the following)

1. Measurements using Vernier calipers, screw gauge and spherometer
2. To determine the Moment of Inertia of a Flywheel.
3. To determine the Moment of Inertia of an irregular body by Inertia Table
4. To determine the Young's Modulus by Bending of Beam Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine g by Bar Pendulum.
7. To determine the Elastic Constants of a Wire by Searle's method.
8. To determine the Young's Modulus of a Wire by Optical Lever Method.

9. To determine g by Kater's Pendulum.
10. To study the Motion of a spring and to determine (a) Spring Constant (b) Value of g
11. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) To check the electrical fuses.
12. Ballistic Galvanometer:
    (i) Measurement of charge and current sensitivity
    (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
13. To compare capacitances using De'Sauty's bridge.
14. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
15. To study the Characteristics of a Series RC Circuit.
16. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor.
17. To determine a Low Resistance by Carey Foster's Bridge.
18. Conversion of galvanometer into voltmeter.
19. Conversion of galvanometer into ammeter.
20. Comparison of two resistances by potentiometer.

Practical Books:

1. Practical Physics vol. I. Gupta Humar, Pragati Prakasan, MeerutA
2. Text Book of Practical Physics, Indu Prakash and Ramakrishna, Kitab Mahal, New Delhi
3. Practical physics, Gupta & Kumar, Pragati Prakasan, Meerut

Semester-II

Paper I: Waves And Oscillations

Wave Motion : Travelling and standing waves on a string. Normal Modes of a string. Group velocity, Phase velocity. Plane waves. Spherical waves. Wave intensity. Differential equation of SHM and its solutions. Kinetic and Potential Energies. Fourier's Theorem and it's applications to square wave, saw tooth wave and triangular wave

Harmonic Oscillations: Simple harmonic oscillations in mechanical and electrical systems. Superposition of Two Collinear Harmonic oscillations: Linearity and Superposition Principle. (1) Oscillations having equal frequencies and (2) Oscillations having different frequencies (Beats). Anharmonic oscillations. Superposition of two Perpendicular Harmonic Oscillations. Lissajous figures.

Damped and Forced Oscillations: Damped harmonic oscillator, power dissipation in damped harmonic oscillator, relaxation time and quality factor. Electrically damped

harmonic oscillator(LCR circuit). Forced harmonic oscillations in mechanical and electrical system. Transient and steady state behaviour, Resonance, sharpness of resonance, bandwidth, energy dissipation, quality factor of forced oscillator, mechanical and electrical impedances.

Ultrasonics and Accoustics: Intensity and loudness of sound -Decibels - Intensity levels - musical notes - musical scale. Generation of ultrasonic waves, their detection and applications, Pizo electric effect , Qurtz crystal, Acoustics of buildings: Reverberation and time of reverberation - Absorption coefficient - Sabine's formula -measurement of reverberation time - Acoustic aspects of halls and auditoria.

Reference Books:

1. Wave and oscillations : J.C.Upadhyaya- Himalaya Publishing
2. Wave and oscillations : N.Subramanyam and Brijlal
3. Oscillations, Waves and Acoustics: M.Ghosh, D.Bhattacharya- S.Chand
4. Waves and Oscillations, Satya Parkash, Pragati Prakashan , Meerut

Paper II: Optics

Geometrial optics and instruments: Fermat's Principle and laws of reflection and refraction using Fermat's principle, coaxial system, Cardinal points of an optical system, combinations of thin lences, Ramsdon's and Hygun's eyepieces, telescope, spectrometer, choromatic and spherical aberrations, various methods to minimize the chromatic aberration (achromatism) and to reduce the spherical aberration.

Interference: Electromagnetic nature of light. Definition and Properties of wave front. Huygens Principle.Interference: Division of amplitude and division of wavefront. Young's Double Slit experiment, Fresnel's Biprism. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination and equal thickness Newton's Rings: measurement of wavelength and refractive index. Michelson's Interferometer: measurement of wavelength and difference of two wavelengths.

Diffraction: Fraunhofer diffraction: Single slit; Double Slit. Multiple slits and diffraction from plane transmission grating. Fresnel Diffraction: Half-period zones. Zone plate. Fresnel Diffraction pattern of a straight edge, a slit and a wire using half-period zone analysis.

Polarization: Transverse nature of light waves. Plane polarized light and production by reflection and refraction, Brewster's and Malus Laws, Double refraction, Nicol prism superposition of two plane polarized light, Circular and elliptical polarization. Quarter wave and half wave plate.

Reference Books:

1. Principles of Optics, B.K. Mathur, 1995, Gopal Printing

2. Optics, S.P.Singh and J.P.Agrawal, Pragati Prakashan Meerut.
3. Physical Optics, A.K.Ghatak.
4. Optics, Satya Prakash, Pragati Prakashan Meerut,
5. Principles of Optics, B.K. Mathur, 1995, Gopal Printing
6. A Text Book of Optics, Subramanyam & Brij Lal,S Chand Publications.

Practical List: (Any 12 of the following)

1. To study damping effect of simple harmonic motion using simple pendulum.
2. To determine the frequency of AC main by sonometer using non magnetic wire.
3. To determine the frequency of AC main by electric vibrator in transverse and longitudinal arrangement.
4. To investigate the motion of coupled oscillator
5. To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment in transverse and longitudinal arrangement
6. To study of Lissajous Figures using CRO.
7. To determine the velocity of sound in air at room temperature using Kundt's tube.
8. To Determination the angle of prism by Spectrometer
9. To determine the Refractive Index of the Material of Prism with mercury light
10. To determine Dispersive Power of the Material of Prism with Mercury Light
11. To determine the value of Cauchy Constants of a material of a Prism.
12. To determine the resolving power of a Prism.
13. To determine the resolving power of telescope
14. To determine wavelength of sodium light using Newton's Rings.
16. To determine wavelength light for different colors b y plane diffraction Grating using mercury light.
17. To determine hight of tower using Sextant.

Practical Books:

1. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
2. Practical Physics Vol II, by Gupta Kumar, Pragati prakasan, meerut.
3. Practical Physics by Vinod Goyal, Ram Nath & Kedar Nath Publications

SEMESTER III

Paper I: Heat And Thermodynamics

Laws of Thermodynamics: Thermodynamic systems and variables, Zeroth Law of thermodynamics and thermal equilibrium. First law and internal energy, conversion of heat into work, Indicator diagram, Thermodynamic Processes, Work Done during Isothermal and Adiabatic Processes, Joule- Thompson expansion of real gas ,

Second Law of Thermodynamics: Inadequacy of first law , Reversible & irreversible processes, Principle of Heat engine and refrigerator, Second law of thermodynamics, Carnot's

cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.

Thermodynamic Potentials: Enthalpy, Gibbs free energy, Helmholtz and Internal Energy functions, Thermodynamic relations & applications : Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for $(C_P - C_V)$, C_P/C_V, second law in terms of entropy.

Theory of Radiation and Kinetic Theory of Gases: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law. Derivation of Maxwell's law of distribution of velocities and its experimental verification. Mean free path , Law of equipartition of energy and its applications to specific heat of gases; mono-atomic and diatomic gases.

Books:

1. Thermal Physics, S. Garg, R. Bansal and C. Ghosh, 1993, Tata McGraw-Hill.
2. Heat and thermodynamics, Pragati prakasan, meerut
3. Heat and Thermodynamics, Brijlal and Subramaniam

Paper II: Solid state physics and Statistical Mechanics

Crystals: Lattice , basis and crystal structure, translation, primitive lattice, two and three dimensional lattice types, point group symmetry and miller indices, sc, fcc and bcc structure: coordination number, packing fraction, NaCl, CsCl and ZnS structures.

Reciprocal lattice: X-ray diffraction, Bragg's law, Laue and Powder method of X-ray diffraction, Reciprocal lattice, Reciprocal of fcc and bcc lattice, Briloun Zone.

Statistical Mechanics: Probsbility and thermodynamical probability, postulate statistical mechanics, macrostate and microstate, Equilibrium and fluctuations constraints, ensembles and average properties, Phase space, μ-space and gamma –space, division of phase space in to cells, Microcanonical, canonical and grand canonical ensembles, Entropy and probability, interpretation of second law of thermodynamics, Boltzmann canonical distribution law,

Kinetic theory of gases: Kinetic theory of gases, Maxwell's distribution laws of speed and velocities, average, rms and most probable speeds , degree of freedom, Brownian motion, mean free path, law of equipartition of energy,

Reference Books:

1. Introduction to Solid State Physics, C. Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
2. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India
3. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill
4. Solid State Physics, R L Sighal
5. Solid-state Physics, S O Pillai
6. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India

7. Solid State Physics, M.A. Wahab, 2011, Narosa Publications
8. Statistical Mechanics, Gupta Kumar,Pragati Prakashan
9. Statistical Mechanics, Satya Prakash, Kedar Nath Ram Nath and Sons

Practical list: (Any 12 of the following)

1. To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method.
2. To determine the Coefficient of Thermal Conductivity of rubber tube.
3. To determine the Coefficient of Thermal Conductivity of glass.
4. Measurement of Planck's constant
5. To determine Stefan's Constant.
6. To verify Newton's Law of Cooling.
7. To determine J by Joule's calorimeter.
8. To study I-V characteristics of Photo cell.
9. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
10. To determine the coefficient of thermal conductivity of a bad conductor by Lee disc method.
11. To verify the laws of probability distribution throwing one coin, two coin and ten coin.
12. To show that deviation of probability from theoretical value decreases with increase in number of events.
13. Study of statistical distribution from the given data and to find most probable, average and rms value.
14. Study of random decay of nuclear disintegration and determination of decay constant using dices.
15. To determine the refractive index of a dielectric layer using SPR
16. To study the PE Hysteresis loop of a Ferroelectric Crystal.
17. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.
18. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four probe method and determine its band gap.
19. To determine the Hall coefficient of a semiconductor sample.

Practical Books:

1. Practical Physics, Gupta & Kumar, Pragati Prakashan , Meerut
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, Kitab Mahal, New Delhi.

Semester-IV

Paper I: Elements of Modern Physics

Fundamental quantum concepts: Planck's quantum theory, Photo-electric effect , Compton scattering. De Broglie wavelength and matter waves; Davisson-Germer experiment. Two slit interference experiment with photons, Wave-particle duality, Matter waves and wave amplitude,

Atomic models and spectra: Rutherford and Bohr atomic modles, Problems with

Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; energy levels and fine structure of Hydrogen like atoms spectra. Optical spectra, L- S , j-j coupling, slection rules, fine structure of sodium d line, Zeeman effect, X-ray spectra and Moseley's law

Nuclear physics: Size and structure of atomic nucleus and its relation with atomic weight Nature of nuclear forces, binding energy, semi-empirical mass formula Radioactivity, α , β and γ-radiation, stability of nucleus; Law of radioactive decay; Mean life & half-life; mass defect, Fission - nature of fragments and emission of neutrons. Nuclear fusion, Nuclear reactor and thermonuclear reactions

Special Theory of Relativity: Constancy of speed of light, Postulates of special theory of relativity, Lorenz transformations, length contraction, time dilation, addition of velocities, relativistic mass, mass energy relation, relativistic momentum and energy, relativistic Doppler Effect

Reference Books:

1. Fundamentals of modern physics, Agrawal and agrawal, pragati Parkashan, meerut
2. Concepts of Modern Physics, Arthur Beiser, 2009, McGraw-Hill
3. Quantum Physics, Berkeley Physics Course Vol.4. E.H. Wichman, 2008, Tata McGraw-Hill .

Paper II: Basic Electrical and Electronic circuits

Basic Electrical current and Circuits: electric current, AC /DC electricity, current density, Equation of continuity, Lorentz –Drudge Theory, Ohm's law, Current and Power, Kirchhoff's laws and applications. Main electric circuit elements and their combinations. Basic electric devices: resistor, inductor and capacitor, colour coding of resistors, Ammeter, Voltmeter, Galvanometer, AC/DC generators, Multimeter, Transformer

Network Analysis and Network Theorems: current source, voltage source, Source equivalence, four terminal networks, open circuits and short circuit impedances, T and π representation, image parameters, iterative parameters. Network theorems: Superposition, Reciprocity, Thevenin's, Norton's and Maximum power transfer theorems

Semiconductor devices: Types of semiconductors: intrinsic and n-type, p-type semiconductors, temperature dependence, energy band and Fermi level in intrinsic semiconductor, concentration of Hole and Electrons, P-N Junction diode, depletion region, forward, reverse biased junction diode, Zener diode, Tunnel diode, Photo diode, LED, Point contact diode & Varactor diode

Rectifier and filters: Diode as circuit element, power supply, Load line concept, Half wave, Full Wave and Bridge rectifier, Shunt capacitor filter, series inductor filter, L-section, π-section and T- section filters , Zener diode as voltage regulator,

Reference Books:

1. Electricity & magnetism , Satya Prakash, Pragati prakashan , meerut
2. Text Book of Electronic devices and Circuits, R S Sedha, S Chand
3. Hand Book of Electronics, Gupta Kumar , Pragati parakashan. Meerut
4. Basic Electronics, Agrawal and Agrawal, pragati parkashan, Meerut

Practical List: (Any 12 of the following)

1. To determine value of Boltzmann constant using V-I characteristic of PN diode.
2. To determine value of Planck's constant using LEDs of at least 4 different colours.
3. To determine the ionization potential of mercury.
4. To determine the wavelength of H-alpha emission line of Hydrogen atom.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
7. To determine the value of e/m by Magnetron Valve method.
8. Thomson method
9. To determine the value of e/m by Millikan oil drop apparatus
10. Verification of Superposition Network theorem
11. Verification of Thevenin's Network theorem
12. Verification of Norton's Network theorem
13. Verification of Maximum power transfer theorem
14. Charactristics of Zener diode
15. Child Langmuir law
16. Frank Hertz experiment

Practical Books:

1. Practical Physics, Gupta & Kumar, Pragati Prakashan Meerut
2. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, Kitab Mahal, New Delhi.

SEMESTER-V

Paper –I : Electronics and Solid State Devices

Solid state devices: Transistors, N-P-N and P-N-P Transistors characteristics (CB, CE and CC Configurations), Current gains α and β parameters, Relations between α and β, Load Line analysis of Transistors. DC Load line and Q-point. Active, Cutoff, and

Saturation regions. Voltage Divider Bias Circuit for CE Amplifier. Field effect Transistors - JFET, MOSFET, UJT, SCR and their characteristics and applications.

Transistor Amplifier: Classification of Amplifiers, transistor biasing, h-parameters, RC coupled amplifier: single stage and double stage, Impedance and Transformer coupled amplifier, Power amplifiers,

Feed back Amplifiers: principle of feed back amplifiers, advantages and disadvantages of negative feed back amplifiers, Types of feed back amplifiers: Voltage series and shunt feed back amplifiers , Current series and shunt feed back amplifiers.

Amplifiers (Voltage and Current)

Operational Amplifier: Characteristics of an Ideal Op-Amp (IC 741), Open-loop & Closed-loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps: (1) Inverting and Non-inverting Amplifiers, (2) Adder, (3) Subtractor, (4) Differentiator, (5) Integrator.

Reference Books:

1. Text Book of Electronic devices and Circuits, R S Sedha, S Chand
2. Hand Book of Electronics, Gupta Kumar , Pragati Parakashan. Meerut
3. Solid State Electronics, Agrawal & Agrawal, Pragati Prakashan Meerut.

Paper-II: Mathematical Physics

Vectors: Product of two vectors, Triple product of vectors, simple application of vectors, Differentiation & partial differentiation, scalar and vector fields, Gradient of scalar field, line, surface and volume integrals of vector field, Divergence and curl and their applications, Gauss divergence and Stoke's theorems

Tensor: n-dimensional space, identical and summation conventions, dummy and ral indices, Kronecker delta symbol, Covariant and contravariant tensor, Rank of tensor and Tensors of higher rank Invariant tensor, Addition, subtraction , product and contraction of tensors, Summation, convention ,Symmetric and Antisymmetric tensor, fundamental tensors, raising and lowering of indices: associated tensors

Matrices : Algebric oerations of matrices: Addition, multiplication, properties of matrix multiplication, sub-matrices, partitioning of matrices, special types of matrices, Tarnspose, Conjugate and Adjoint of matrices, symmetric and antisymmetric matrices, Hermition and skew hermition matrices, determinat of matrices, unitary matrices.

Laplace and Fourier Transform: Definition of Laplace transform, condition of existence of Laplace transform, properties of Laplace transform, Laplace transform of derivative f(t) and derivative of order n, Laplace transform of integral of f(t), Laplace transform of multiplication by t, Laplace transform of division by t, Initial and Final value theorems. Fourier integral and its

forms, Fourier theorem and its application to square wave, saw tooth wave and triangular wave

Reference Books:

1. Mathematical Physics, Satya Prakash, Pragati Prakashan, Meerut
2. Mathematical Physics, Dass and Verma, S Chand & company
3. Mathematical physics, B S Rajput,

Practicals List:

1. Charactristics of PN junction diode
2. Charactristics of Zener diode
3. Charactristics of NPN / PNP Transistors (CE, CB and CC configuration)
4. Charactristics of Tunnel diodestudy of ripple factor of power supply using L and π-section filters.
5. Study of Half wave and full wave rectifiers
6. Study of regulated poer supply
7. Study of VR tube
8. Single stage RC coupled amplifier
9. Single staghe Transitor coupled amplifier
10. Study of RC coupled amplifier with negative feedback
11. Band gap of semiconductor using PN junction diode
12. OP - Amplifier: Add , Sub, Diff and Intg

Practical Books: Practical Physics, Gupta & Kumar, Pragati Prakashan, Meerut

SEMESTER-VI

Paper I : Quantum Mechanics

Time dependent Schrödinger equation: Concept of wave function, Time dependent Schrödinger equation and dynamical evolution of a quantum state; Properties of Wave Function. Interpretation of wave function Probability and probability current densities, Conditions for Physical acceptability of Wave Functions. Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum & Energy operators and commutation relations; Expectation values of position and momentum and energy.

Time independent Schrödinger equation-Hamiltonian, stationary states and energy eigenvalues; expansion of an arbitrary wavefunction as a linear combination of energy eigenfunctions; General solution of the time dependent Schrödinger equation in terms of linear combinations of stationary states; Application to the spread of Gaussian wave packet for a free particle in one dimension; wave packets, Fourier transforms and momentum space wave function.

Application of Schrödinger wave equation in one dimension: Particle in one dimensional box, quantization of momentum and energy, continuity of wave function, boundary condition and emergence of discrete energy levels; Potential step and potential barrier, Tunneling effect, one dimensional harmonic oscillator: energy levels and eigen functions

Quantum theory of hydrogen-like atoms: Time independent Schrödinger equation in spherical polar coordinates; separation of variables for the second order partial differential equation; Radial wave functions , magnetic and orbital quantum numbers, spherical harmonics, radial Wave functions , energy levels, significance of quantum numbers, n, l, and m.

Reference Books:

1.A Text book of Quantum Mechanics, P.M.Mathews & K.Venkatesan, 2nd Ed., 2010, McGraw Hill

2. Quantum Mechanics, E. Merzbacher, 2004, John Wiley and Sons,

3.Quantum Mechanics , Satya Prakash, Pragati Prakashan, Meerut

4, Quantum Mechanics, Bransden & Joachain, Pearson Education publications

Paper-II : Digital and optoelectronics

Number Systems, Codes and Boolean Algebra: Binary, Decimal, Octal and Hexa decimal number systems & inter conversion, BCD, Gray, 8421, excess-3 codes, Laws of Boolean algebra, De Morgan's theorems

Digital Circuits: Difference between Analog and digital circuits, Logic gates (AND, OR, NOT, AND, NAND, XOR & XNOR) with circuits,. NAND and NOR Gates as Universal Gates. Half adder and full adders.

IC Technology:

Basic idea of IC technology, IC 555 Pin diagram and its application, Monolythic ICs, IC components(Integrated, Diffused, Thin Film), MOS Capacitors, Inductors, Thin film technology

Optoelectronics and Laser: Optical fiber, Graded index, step index fibers, refractive index, propagation of optical beams in fibers, fibers mode characteristics and cut off conditions, losses in fibers. Principle of Laser, Ruby laser, He Ne laser, Solid state laser.

Books:

1. Digital Electronics, Malvino, TMH publications
2. Digital electronics: Principle and practice, Kapoor and Maheswari, Mackmillan publ.

3. Text book of eletronics, D C Tayal, Kedar Nath Ram Nath Publications.

Practicals List :

1. Study of Logic Gates(OR, AND, NOR , NAND, XOR)
2. Verification of De Morgan's theorems
3. Study of Half adder
4. Study of full adder
5. Study of 555 timer
6. Study of Characteristics of LED
7. Study of Characteristics of UJT
8. Study of Characteristics of JFET
9. Study of Characteristics of MOSFET
10. Study of Characteristics of SCR
11. Study of Electron Spin Resonance (ESR)- determine magnetic field as a function of the resonance frequency
12. To determine the wavelength of Laser light using Diffraction of Single Slit.

Practical Books:

1. Practical Physics, Gupta & Kumar, Pragati prakashan Meerut
2. Advanced practical physics, SP singh, Pragati prakasan Meerut.