Physics

Programme Specific Outcome

- The main aim of the U.G. degree program is to understand of core knowledge in Physics, including classical mechanics, quantum mechanics, electromagnetic theory, Basic electronics, optics, special theory of relativity and modern physics.
- Students will design and conduct experiment/experiments, demonstrating their understanding of the scientific method and processes and also the analytical methods required to interpret and analyze results and finalize conclusions for data. Students also get the analytical approach to modeling of physical phenomena.

Course Outcome

B Sc-1

Mechanics, Oscillations and properties of Matter

- Understanding the definition formotion of Laws, central force, Kepler’s Law and different co-ordinat system and conservation lawsetc.
- Understanding the dynamics and gravitation.
- Simple Harmonic Motion, Lissajous Figures, and concept of different **Oscillators.**
- Study the behavior of rigid body notation, principle moments and axes, concept of Oscillations and their applications.
- Study the electron gun, linear accelerator, concept of CRO. Concept of cyclotron.
- Study of bending behavior beams andanalyze the expression for youngs modulus.
- To understand the surface tension and viscosity of fluid.

Electricity, Magnetism, and Electromagnetic Theory

- Studytheelectricfieldusingcoulomb’sinversesquarelawinelectrostatics ofcurrent.
- Understand the faraday’s laws of electromagnetic.
- Analyze thev alue of Maxwell equation.
- Basic concept of integration and differentiation.
- Study of the concept of Vector Space.
- Study the Dialectic Constants.

B Sc-2

Thermodynamics, kinetic theory and statistical physics

- Understand the nature law of entropy and thermodynamics.
- To study the different law of thermodynamics and entropy.
- Understanding the low temperature physics.
- To study thermal conductivity and blackbody radiation.
- To study Planck’s Law.
- Understanding the statistical method Wave, acoustic and optics
- Analyze waves and oscillations.
- Study the basic properties and production of ultrasonic by different methods.

- Understand the natural behavior of aberration in lens.
- Study the theory and experiment of interference using air wedge, Newton's rings and Michelson interferometer
- Study the theory and experimental past of diffraction by Fresnel's and Fraunhofer methods.
- Study the theories for production of polarization of light.

B Sc-3

Relativity, quantum mechanics, Atomic Molecular and nuclear physics

- Understand the negative result of Michelson Morley Experiment, Galilean and Lorentz transformation.
- To study the black-body radiation, photo-electric effect, concept of uncertainty principle.
- Learn the mathematical tools needed to solve quantum mechanics problems.
- To study the basics of nucleus and their energy.
- To know the procedures for nuclear fission and fusion.

Solid state physics, solid state devices and electronics

- To understand the basic concepts of force between atoms and bonding between molecules
- Analyze the relationship between conductors and insulators.
- To understand the concept and the properties of semi-conductor.
- To study the Langevin's theory, Weiss' Law, concept of diode and transistor.
- To study the rectifiers, filter circuit, amplifiers and oscillators.
- To the study basic concept of computer and c programing.

M. Sc.
Programme Specific Outcome

M Sc-1st Semester

1. **Mathematical Methods-I**
2. **Classical Mechanics**
3. **Numerical Methods and C Programming**
4. **Electronics-1**

M Sc-2nd Semester

1. **Mathematical Methods-II**
2. quantum mechanics-I
3. Electro Dynamics
4. Electronics-II

M Sc-3rd Semester

1. quantum mechanics-II
2. Statistical Mechanics
3. Condensed matter Physics-I
4. Electronics-III

Course Outcome M Sc4th Semester

1. Condensed matter Physics-II
2. Nuclear Physics
3. Atomic and Molecular Physics
4. Electronics-IV

Course Outcome MSc-1st Semester

Paper- I Mathematical Methods-I

To Learn about Vector spaces and matrices Eigen values and Eigen vectors.
Concept of matrices, Delta function, Dirac delta function, Bessel functions green function and their recurrence relations, second order differential equations and familiarized with Legendre polynomials, Cauchy integral formula and Hermite differential equation,To know the fundamentals and applications of Fourier series, Fourier and Laplace transforms, their inverse transforms etc.

Paper- I I Classical Mechanics

To Learn Mechanics of particle conservation principles The D'Alemberts, Lagrangian and Hamiltonian approaches in classic mechanics. Poisson brackets and Hamilton -Jacobi equation, Euler's equations of motion, Theory of Hamiltonian formulation, vibrational principle and canonical transformation.

Paper- III Numerical Methods and C Programming

To Learn computational procedure, programming outlines, variables, constants, operators in c programming and control structure if, if else, for loop, while loop, goto statement, and concept of functions and arrays and also learn about numerical methods iterative, matrix inversion, power, Jacobi, newton cotes, Euler and Runga Kutta methods.

Paper- I V Electronics-I

To Learn bipolar junction transistor, baising of BJT, h-parameters, feedback amplifiers, FET,MOSFET,UJT,MIS diode, MOS diode, Tunnel diode, Gun diode, IMPATT diode, and frequency division multiplexing and concept of modulation and demodulation in communication system.

Course Outcome M Sc-2nd Semester

Paper- I Mathematical Methods-II

To learn Tensors, Green function ,methods of constructing Green function, Poisson and Laplace equations, Fourier and Laplace transform methods, analytical fuction, Couchy-Riemann condition, Couchy integral theorem and Contour integratio

Paper- I I Quantum Mechanics-I

To Learn Schrodinger equation, Ehrenfest theorem, Potential wells and barriers, Harmonic Oscillator, Uncertainty relation, direct Delta function, angular momentum, Eigen values, Clebsch-Gordon coefficients, central force problem, symmetric potential, Hydrogen atom, Time dependent perturbation theory, Stark and Zeeman effect.

Paper- III

To Learn Maxwell equations, Electromagnatic energy, Poyting theorem, plane Electromagnatic wave in conducting and non conducting medium, boundary condition at interface of two media, Frenels equation, Bresters lawwave guides, TM modes and TE modes, Einsteins special theory of relativity, Galillean and Lorentzs transformation, Minkowski space, concept of four vectors, Lorentz gauge, Lienard Wiechart potentials, Larmars formula, Cherenkov radiation.

Paper- I V Electrodynamics

To Learn Radiative and non radiative transitions , photoconductive devices (LDR) , Emission spectra , Luminescent efficiency , method of excitation. Light emitting diode (LED), Diode Laser, Photo detectors, Photoconductor,. Phototransistor., Solar cells, Solar radiation, solar spectrum, PN junction solar cells, Hetero junction, Interface thin film solar cells, Basic Op-amp. Differential amplifier Block diagram of a typical Op-amp. Voltage follower. Practical Op-amp.instrumentation amplifier, integrator and differentiator, Oscillators' principles, the phase shift oscillator. Wein bridge oscillator, Multivibrators, Monostable and Astable , Comparators, square wave and triangle wave generators.

Course Outcome M Sc-3rd Semester

Paper- I Quantum Mechanics II

To Learn Variational method, principle, Application to problems like H atom, He atom, harmonic oscillator. WKB method, tunneling through potential barrier, application to decay Time dependent perturbation theory, harmonic perturbation theory, harmonic perturbation, Fermi's Golden rule, absorption , selection rule, Collis scattering cross section, Born approximation square well potential, Partial wave, phase shift, scattering by rigid sphere and square well, Identical particle symmetric anti symmetric wave function, spin angular momentum., Klein Gorden equation, Dirac equation for free particle.

Paper- I I Statistical Mechanics

To Learn Foundation of statistical mechanics, classical ideal gas entropy of mixing and Gibb.s paradox. Microcanonical ensemble, phase space,Liouville theorem, canonical and grand canonical ensembles, partition function, Statistics of ensembles, density matrix, Maxwell~ Boltzmann, Fermi Dirac and Bose- Einstein statistics, , Bose . Einstein condensation, Boltzman transport equation, mean field theory of Ising model in 3, 2 and 1 dimension, Thermodynamics fluctuation,Brownian movement, Langevin theory, fluctuation dissipation theorem, Fokker-Plank equation.

Paper- III Condensed Matter Physics I

To Learn Crystalline and amorphous solids, unit cells and direct lattice. Bravais lattices, fundamental elements of symmetry, concept of point group and space groups, crystal planes and Miller indices, Laue's equation, Bragg's Law, Reciprocal lattice, Brillolin Zones, Defects or imperfections in crystals and their classification, Point defects, Schottky and Frenkel defects, the role of dislocations in Plastic deformation and crystal growth, Block theorem, Kroning-Panny model, Band theory, effective mass, Tight bonding, ,Fermi surface cyclotron resonance, quantum Hall Effect, Weiss theory of ferromagnetism, Heisenberg model and molecular field theory Doman's and Block wall energy. Spin waves and magnoins.

Paper- I V Electronics III

To Learn Number system : Decimal, Binary, Octal and Hexadecimal Number System with mutual conversion, BCD code (8421), Excess -3 code, gray code, binary to gray code and gray codeto binary code conversion. Logic gates, Basic laws of Boolean Algebra, De-Morgan's Theorem, K-Map, Ex-OR gate, Ex-NOR gate circuitry, Half adder, Full adder, ,Half Subtracter, Full Subtracter, Decoder, BCD to decimal decoder, BCD to sevensegment decoder, Encoder, Multiplexer, DeMultiplexer, Flip-flop, RS flip-flop, JK flip-flop, JK Master Slave flip-flop, Binary ripple counter, Registers, shift Register, Digital to analog converter and Analog to Digital converters,Intergraded Circuit, Basic technology of monolithic.

Course Outcome M Sc 4th Semester

Paper- I Condensed Matter Physics II

To Learn Superconductivity, Meissner effect, type I and type II superconductors, London's equations, , Cooper pairing due to phonons, BCS theory of superconductivity ,A.C./D.C. Josephson effect, Polarization, Lorenz field, dielectric constant ,Ferro electric crystal, Landau theory of phase transition, Energy bands in semiconductor, Intrinsic and Extrinsic semiconductors, semimetals, Elementary ideas of nano structure, Interatomic forces and lattice dynamics of simple metals, ionic and covalent crystals, Quantization of elastic waves/ phonons, , thermal expansion, lattice thermal conductivity.

Paper- I I Nuclear Physics

To learn Nuclear Decay, α particle spectra, Geiger Nuttal law, β decay, Fermi theory of β decay, selection rules, Nuclear Reactions and Energy, Conservation laws, compound nucleus, fission process; cross sections, nuclear chain reactions, nuclear reactor, Counters and Accelerators, solid state counter,: Cyclotron, linear accelerators, Elementary Particles, basic particle interactions, conservation laws, Electron and positron, proton and antiproton, neutrino and antineutrino, mesons and hyperons, Quark theory.

Paper- III Atomic and Molecular physics

To Learn Spectra of hydrogen and hydrogen like atoms, , Pauli's Vector atom model, four quantum numbers, Spectra of alkali atoms, Spin orbit interaction and fine structure in alkali spectra, Spectra of Helium, L S and J J coupling, Continuous X-ray spectrum, Duane and Hunt's law, Characteristics X-ray, Mosle'y law, Doublet Fine structure of X-ray spectra, Lande g-factor, Stark effects, Electron spin resonance, Nuclear magnetic resonance.Diatomic linear symmetric top, asymmetric top molecules, spectra of symmetric top and asymmetric top molecules, Rotational energy and spectra of diatomic molecules, Vibrational energy of diatomic molecule, Molecule as vibrating rotor, vibration rotational spectra of diatomic molecule, selection rules, Frank Condon principle, Born- Oppenheimer approximation, P, Q and R branches, I R spectrometer.

Paper- I V Electronics IV

To Learn Microprocessor & Micro Computers:-Evolution of Microprocessor, Internal Microprocessor, Architecture, Architecture of digital Computer, Semiconductor memories (RAM, ROM, PROM, EPROM, Shift register), Magnetic Memory: - Floppy disks, Hard disks, Optical Disks, Magnetic Bubble Memory Local Area Networking (LAN) , LAM topology (Bus, Star, Ring) , Addressing Modes, Direct Addressing, Instruction set of 8085 ,Data transfer group, Arithmetic group. Logicalgroup. Assembly Language Programs, Optical Fibers, Refraction and Snell's law, Total internal refraction, Light propagation through and optical fiber, Types of Optical Fiber : HPSUU, HPSIR, Halide fiber, Optical fiber cables, Multifibre cable, Advantage and Disadvantage of optical fiber.