

Programme Matrix: Bachelor of Science (RNEP SCHEME)

Department of Physics

I Semester			
Course Type	Course Code	Course Title	Course Outcome
Hard Core (DSC-1)	HMA 590	Mechanics and properties of matter	CO1: Apply the principles of mechanics to analyse motion in inertial and non-inertial frames, particle dynamics, rigid-body rotation, and conservation laws of linear momentum, angular momentum, and energy. CO2: Analyse and solve physical problems involving central forces, planetary motion, collisions, rocket motion, oscillations, gravitation, and rigid-body systems using appropriate mathematical and physical models. CO3: Explain and apply the fundamental principles of elasticity, fluid mechanics, and surface tension to determine mechanical properties, fluid behaviour, viscosity, pressure, and surface phenomena, including relevant experimental methods and numerical problems.
Hard Core (Practical-1)	HMA 590P	Mechanics and properties of matter	CO1: Apply principles of mechanics, elasticity, oscillations, rotational motion, and fluid mechanics to experimentally determine physical quantities such as acceleration due to gravity, Young's modulus, rigidity modulus, moment of inertia, radius of gyration, surface tension, and viscosity using appropriate experimental methods and graphical analysis. CO2: Develop proficiency in experimental measurement, data analysis, graph plotting, and interpretation of results, while evaluating the accuracy and reliability of experimental observations and relating the measured physical parameters to their underlying physical principles.

II Semester			
Course Type	Course Code	Course Title	Course Outcome
Hard Core (DSC-2)	HMB 590	Heat and thermodynamics	CO1: Comprehending the principles of kinetic theory, statistical physics, thermal conductivity, blackbody radiation, and quantum statistics to interpret the thermal and microscopic properties of matter CO2: Analyse and solve thermodynamic processes and cycles using the laws of thermodynamics, entropy, thermodynamic potentials, Maxwell's relations, phase transitions, and low-temperature phenomena, including Carnot engines, refrigerators, liquefaction, and Joule–Thomson expansion. CO3: Apply and evaluate the principles of kinetic theory, thermodynamics, low-temperature physics, and vacuum technology to derive relevant physical relations, interpret experimental phenomena, and solve quantitative problems involving real gases, cryogenics, and low-pressure systems.
Hard Core (Practical-2)	HMB 590P	Heat and thermodynamics	CO1: Apply statistical, thermal, and electrical measurement techniques to perform physics experiments, collect observations, and determine physical constants and material properties using appropriate experimental methods. CO2: Analyse experimental data using graphical, computational, and error-analysis techniques to verify physical laws, interpret results, calculate uncertainties, and draw scientifically valid conclusions.

III Semester			
Course Type	Course Code	Course Title	Course Outcome
Hard Core (DSC-3)	HMC 590	Waves, acoustics and optics	CO1: Gaining the knowledge on concepts of Waves, Simple harmonic motion and their Analysis of complex waves. CO2: Comprehending the topic of Acoustics, Ultrasonic, Velocity of light and Interference. CO3: Acquiring knowledge on concepts of Diffraction and Polarization.
Hard Core (Practical-3)	HMC 590P	Waves, acoustics and optics	CO1: Apply fundamental principles of wave optics, acoustics, and wave motion to experimentally determine physical quantities such as velocity, wavelength, frequency, radius of curvature, and dimensions of small objects using appropriate laboratory techniques. CO2: Analyse and interpret experimental observations involving interference, diffraction, polarization, dispersion, and optical properties of materials to determine refractive indices, dispersive/resolving powers, grating constants, Cauchy's constants, and concentration of optical solutions.
Soft Core (Elective-1)	HMC	Laser and fibre optics	CO1: Gaining the knowledge on parameters of Laser and its applications. CO2: Acquiring the knowledge on Fibers optics types and its characteristics.

IV Semester			
Course Type	Course Code	Course Title	Course Outcome
Hard Core (DSC-4)	HMD 590	Electricity and electromagnetism	CO1: Apply the principles of electrostatics, galvanometers, thermoelectricity, and network theorems to analyze electrical systems and solve related numerical problems. CO2: Analyze AC circuits, resonance, power factor, AC bridges, CRO measurements, and RC filters using appropriate mathematical and circuit-analysis techniques. CO3: Explain and apply the fundamental concepts of electromagnetism and Maxwell's equations to analyze electromagnetic waves, energy propagation, radiation, and the production of electromagnetic waves.
Hard Core (Practical-4)	HMD 590P	Electricity and Electromagnetism	CO1: Apply practically the fundamental principles of electrical circuits, electromagnetic induction, capacitance, and thermoelectricity to perform experimental measurements and verify relevant laws and relationships. CO2: Analyse and interpret experimental characteristics of AC/DC circuits and electronic systems using bridges, galvanometer, potentiometer, CRO, and filters to determine electrical parameters such as inductance, capacitance, resistance, frequency, phase difference, and quality factor.
Soft Core (Elective-2)	HMD	Communication systems	CO1: Comprehension of characteristic importance in communication system, and behavioural knowledge on transducers. CO2: Acquiring the knowledge on Radio communication, Modulators, Amplifiers and other communication systems
Soft Core (Practical-5/Skill)	HMD	Practical-5	CO1: Applying the skill of determining the characteristics of laser and its applications. CO1: Executing the skill to determine the characteristics of Optical fiber and its applications

V Semester			
Course Type	Course Code	Course Title	Course Outcome
Hard Core (DSC-5)	HME 590	Classical mechanics, quantum mechanics and atomic spectroscopy	CO1: Comprehension of Newton's laws of motion, conservation momentum and energy. Also to gain knowledge on constrains, degrees of freedom and harmonic oscillator and Hamiltonian mechanics. CO2: Explaining the minimum uncertainty of measuring both observables on any quantum state and Analyse the time-dependent and time-independent Schrödinger equation for simple potentials like for instance one-dimensional potential well and Harmonic oscillator. CO3: Interpretation of Electron, atomic spectra of elements and Zeeman effect.
Hard Core (DSC-6)	HME 592	Nuclear and particle physics	CO1: Comprehension of the topics of properties of Nuclei, Radioactivity decay and Detectors. CO2: Gaining the knowledge on the concepts of Accelerators, Interaction of nuclear radiation with matter, Mass spectrography and Nuclear Models. CO3: Acquiring the knowledge on Nuclear reactions, Nuclear Fission and Fusion, Cosmic rays and Elementary particles.
Hard Core (Practical-6)	HME 590P	Practical - 6	CO1: Analyse and Apply the concepts of Classical Mechanics, Quantum Mechanics and Atomic Spectroscopy to Physics laboratory work. CO2: Apply the principles of nuclear and particle physics to analyse nuclear phenomena, radioactive processes and the fundamental constituents and interactions of matter.

VI Semester			
Course Type	Course Code	Course Title	Course Outcome
Hard Core (DSC-7)	HMF 590	Relativity and solid state physics	CO1: Gaining the knowledge on Special theory of relativity and Superconductors. CO2: Comprehending the knowledge of Free electron theory of metals and Dielectrics. CO3: Acquire knowledge about Crystal structure and X-rays, Magnetism and Specific heat of solids.
Hard Core (DSC-8)	HMF 592	Astrophysics and molecular spectroscopy	CO1: Acquiring the knowledge on Stellar Properties, Stellar Classification and Evolution and Stellar pressure and temperature CO2: Gaining knowledge on the concepts of Molecular spectroscopy and Raman effect concept.
Hard Core (Practical-7)	HMF 590P	Practical - 7	CO1: Gaining practical knowledge in conducting experiments to determine fundamental physical constants, semiconductor properties, thermal and electrical characteristics of materials, and optical properties using standard laboratory instruments and experimental techniques CO2: Analyze and interpret experimental data using appropriate mathematical models and graphical methods, including X-ray diffraction techniques, to evaluate material properties such as lattice parameters, particle size, Hall coefficient, mobility, and Fermi energy, while estimating experimental Uncertainties.