B.Sc. Physics Course Outcomes Summary Sheet

Course	Title	Course Outcome 1	Course Outcome 2	Course Outcome 3	Course Outcome 4	Course Outcome 5
B.Sc. Part-I	Mechanics (I)	1. Grasp Galilean transformations for displacement, velocity, and acceleration between frames.	2. Explain the Coriolis force and its impact on Earth-relative motion.	3. Solve problems involving particle motion under conservative forces using potential energy curves.	4. Calculate the center of mass and study motion of systems with varying mass.	5. Analyze trajectories for different central force scenarios, including elliptical and circular orbits.
B.Sc. Part-I	Electromagnetism (II)	1. Master the concepts of electric and magnetic fields, gradient, divergence, and curl.	2. Solve Laplace's equation in Cartesian coordinates and apply it to various electrostatic problems.	3. Explain the concept of dielectric polarization and its impact on electric fields.	4. Use the Biot-Savart law to calculate the magnetic field due to various current configurations.	5. Apply Maxwell's equations to analyze the propagation and interaction of electromagnetic fields.
B.Sc. Part-I	Optics (III)	1. Explain the concept of coherence and its crucial role in interference.	2. Analyze diffraction phenomena and interpret their characteristic patterns.	3. Grasp the concepts of light polarization and manipulate its properties.	4. Understand the principles of laser operation and explore its diverse applications.	5. Gain basic knowledge of optical fibers and their role in modern communication.
B.Sc. Part-II	Thermodynamics & Statistical Mechanics (I)	1. Understand the principles of phase transitions and heat engines using Clausius-Clapeyron equation and Carnot's cycle.	2. Explain Joule-Thomson expansion and its influence on ideal and non-ideal gases.	3. Master Maxwell's distribution law of molecular velocities and its implications.	4. Distinguish between microscopic and macroscopic states, applying Stirling's formula.	5. Apply Bose-Einstein and Fermi-Dirac distribution laws to various physical phenomena.
B.Sc. Part-II	Mathematical Physics & Special Relativity (II)	1. Apply gradient, divergence, and curl operators in non-Cartesian coordinate systems (circular, cylindrical, spherical).	2. Master Lorentz transformations and comprehend their implications for time dilation and length contraction.	3. Master techniques for solving second-order linear differential equations with variable coefficients and singular points.	4. Applying Laplace and Helmholtz Equations to Physical Systems	5. By exploring these special functions and solutions to differential equations, students gain critical mathematical tools for solving problems in quantum mechanics and understanding wave phenomena.
B.Sc. Part-II	Electronic Circuits & Analog Devices (III)	1. Differentiate and analyze various circuit elements (resistors, capacitors, inductors, etc.).	2. Distinguish between active and passive networks and identify parameters related to their performance.	3. Explain the physics of PN junctions, including charge distribution, drift, and diffusion.	4. Extend your knowledge to Junction Field Effect Transistors (JFETs) and Metal Oxide Semiconductor Field Effect Transistors (MOSFETs), understanding their biasing and operating characteristics.	5. Develop Skills in Digital Logic and Oscillator Design.Implement Boolean logic using basic gates (
B.Sc. Part-III	Quantum Mechanics (I)	1. Bridging the Gap between Classical and Quantum Mechanics.	2. Formulate the general wave equation for matter waves and derive the time-dependent and time-independent Schrödinger equation.	3. Investigate various potential configurations (step, well, barrier) and understand their impact on particle behavior.	4. Formulate the Schrödinger equation in spherical coordinates for the one-electron atom and separate it into radial and angular variables.	5. Qualitatively explain the fine structure of atomic spectra and understand the Frank-Hertz experiment.
B.Sc. Part-III	Nuclear and Particle Physics (II)	1. Demystifying the Nucleus:Analyze Rutherford scattering experiments and understand the basic constituents of the nucleus (mass, size, charge, density).	2. Master the concepts of nuclear fusion and fission, including spontaneous fission and its explanation through the liquid drop model.	3. Gain knowledge of particle accelerators and their types (Van de Graaff, linear accelerator, cyclotron, synchrocyclotron, proton synchrotron, betatron), understanding their mechanisms.	4. Appreciate the discovery of elementary particles and delve into their classification based on quantum numbers.	5. Understand the concepts of the quark model and the "number revolution" related to quarks.
B.Sc. Part-III	Solid State Physics (III)	1. Explore periodicity in lattices, identify unit cells and primitive cells, understand translation vectors, and classify crystals based on crystal systems and packing fractions.	2. Analyze the formation of bands in solids using the periodic potential and Bloch theorem.	3. Explain the phenomenon of thermionic emission and analyze the role of Hall effect in metals.	4. Classify different types of magnetic materials based on their magnetic properties.	5. By grasping the fundamental principles of solid state physics, students will be equipped to understand and develop technologies based on diverse material properties.

B.Sc. Physics Program Summary Sheet:			
S.NO.	**Program Outcomes (POs):**	**Program Specific Outcomes (PSOs):**	**Program Educational Objectives (PEOs):**
PO1/PSO1/PEO1	PO 1: Apply fundamental principles of physics to analyze and solve problems in various natural phenomena.	PEO 1: Obtain employment or pursue further studies in physics/related fields.	PSO 1: Master advanced theoretical concepts in classical and quantum mechanics, electromagnetism, statistical physics, and solid-state physics.
PO2/PSO2/PEO2	PO 2: Employ mathematical and computational methods to model, analyze, and interpret physical systems.	PEO 2: Demonstrate strong critical thinking, complex problem-solving, and effective communication.	PSO 2: Develop expertise in experimental techniques for investigating physical phenomena in various areas of physics.
PO3/PSO3/PEO3	PO 3: Design and conduct experiments to investigate physical phenomena, collect and analyze data, and draw valid conclusions.	PEO 3: Be valued for ethical conduct and commitment to responsible science use.	PSO 3: Gain proficiency in computational methods for modeling and simulating physical systems.
PO4/PSO4/PEO4	PO 4: Effectively communicate scientific information through written and oral presentations, technical reports, and visual aids.	PEO 4: Contribute to scientific knowledge and development of innovative technologies.	PSO 4: Prepare for further studies in physics or related fields, or for careers in research, development, or teaching.
PO5/PSO5/PEO5	PO 5: Work effectively in teams to solve complex problems and collaborate with professionals from diverse backgrounds.	PEO 5: Be lifelong learners who continuously expand knowledge and skills in physics.	PSO 5: Apply physics knowledge to solve real-world problems and contribute to technological advancements.
PO6/PSO6/PEO6	PO 6: Demonstrate ethical responsibility and awareness of the social and environmental implications of scientific research.		
PO7/PSO7/PEO7	PO 7: Pursue lifelong learning and professional development in the field of physics.		

Mapping of Course Outcomes of all courses of B.Sc. Physics with Program Outcomes, Program Specific Outcomes, and Program Educational Objectives

Course Outcomes	Program Outcomes	Program Specific Outcomes	Program Educational Objectives	Level
B.Sc. Part-I Paper I: Mechanics				
1. Grasp Galilean transformations for displacement, velocity, and acceleration between frames.	PO1, PO2	PSO1	PEO1, PEO2	Understand (Low)
2. Explain the Coriolis force and its impact on Earth-relative motion.	PO1, PO3	PSO1	PEO1, PEO2	Apply (Medium)
3. Solve problems involving particle motion under conservative forces using potential energy curves.	PO1, PO2	PSO1	PEO1, PEO2	Analyze & Apply (Medium)
4. Calculate the center of mass and study motion of systems with varying mass.	PO1, PO2	PSO1	PEO1, PEO2	Analyze & Evaluate (Medium)
5. Analyze trajectories for different central force scenarios, including elliptical and circular orbits.	PO1, PO2	PSO1	PEO1, PEO2	Analyze & Create (High)
B.Sc. Part-I Paper II: Electromagnetism				
1. Master the concepts of electric and magnetic fields, gradient, divergence, and curl.	PO1, PO2	PSO2	PEO1, PEO2	Understand & Remember (Low)
2. Solve Laplace's equation in Cartesian coordinates and apply it to various electrostatic problems.	PO1, PO2	PSO2	PEO1, PEO2	Analyze & Apply (Medium)
3. Explain the concept of dielectric polarization and its impact on electric fields.	PO1, PO2	PSO2	PEO1, PEO2	Apply & Analyze (Medium)
4. Use the Biot-Savart law to calculate the magnetic field due to various current configurations.	PO1, PO2	PSO2	PEO1, PEO2	Apply & Evaluate (Medium)
5. Apply Maxwell's equations to analyze the propagation and interaction of electromagnetic fields.	PO1, PO2	PSO2	PEO1, PEO2	Analyze & Create (High)
B.Sc. Part-I Paper III: Optics				
1. Explain the concept of coherence and its crucial role in interference.	PO1, PO2	PSO3	PEO1, PEO2	Understand & Remember (Low)
2. Analyze diffraction phenomena and interpret their characteristic patterns.	PO1, PO2	PSO3	PEO1, PEO2	Analyze & Evaluate (Medium)
3. Grasp the concepts of light polarization and manipulate its properties.	PO1, PO2	PSO3	PEO1, PEO2	Analyze & Apply (Medium)
4. Understand the principles of laser operation and explore its diverse applications.	PO1, PO3	PSO3	PEO1, PEO2	Analyze & Evaluate (Medium)
5. Gain basic knowledge of optical fibers and their role in modern communication.	PO1, PO2	PSO3	PEO1, PEO2	Understand & Remember (Low)
B.Sc. Part II Paper I: Thermodynamics & Statistical Mechanics				
1. Understand the principles of phase transitions and heat engines using Clausius-Clapeyron equation and Carnot's cycle.	PO1, PO2	PSO4	PEO1, PEO2	Understand & Remember (Low)
2. Explain Joule-Thomson expansion and its influence on ideal and non-ideal gases.	PO1, PO2	PSO4	PEO1, PEO2	Apply & Evaluate (Medium)
3. Master Maxwell's distribution law of molecular velocities and its implications.	PO1, PO2	PSO4	PEO1, PEO2	Analyze & Evaluate (Medium)
4. Distinguish between microscopic and macroscopic states, applying Stirling's formula.	PO1, PO2	PSO4	PEO1, PEO2	Analyze & Evaluate (Medium)
5. Apply Bose-Einstein and Fermi-Dirac distribution laws to various physical phenomena.	PO1, PO2	PSO4	PEO1, PEO2	Analyze & Create (High)
Paper II: Mathematical Physics & Special Relativity				
1. Apply gradient, divergence, and curl operators in non-Cartesian coordinate systems (circular, cylindrical, spherical).	PO2	PSO5	PEO1, PEO2	Apply & Remember (Medium)
2. Master Lorentz transformations and comprehend their implications for time dilation and length contraction.	PO1, PO2	PSO5	PEO1, PEO2	Analyze & Evaluate (High)
3. Master techniques for solving second-order linear differential equations with variable coefficients and singular points.	PO2	PSO5	PEO1, PEO2	Analyze & Create (High)
4. Applying Laplace and Helmholtz Equations to Physical Systems	PO1, PO2	PSO5	PEO1, PEO2	Analyze & Apply (High)

5. By exploring these special functions and solutions to differential equations, students gain critical mathematical tools for solving problems in quantum mechanics and understanding wave phenomena.	PO1, PO2	PSO5	PEO1, PEO2	Analyze & Create (High)
B.Sc. Part-II Paper III: Electronic Circuits & Analog Devices				
1. Differentiate and analyze various circuit elements (resistors, capacitors, inductors, etc.).	PO1, PO2	PSO6	PEO1, PEO2	Understand & Remember (Low)
2. Distinguish between active and passive networks and identify parameters related to their performance.	PO1, PO2	PSO6	PEO1, PEO2	Analyze & Evaluate (Medium)
3. Explain the physics of PN junctions, including charge distribution, drift, and diffusion.	PO1, PO2	PSO6	PEO1, PEO2	Analyze & Apply (Medium)
4. Extend your knowledge to Junction Field Effect Transistors (JFETs) and Metal Oxide Semiconductor Field Effect Transistors (MOSFETs), understanding their biasing and operating characteristics.	PO1, PO2	PSO6	PEO1, PEO2	Analyze & Evaluate (Medium)
5. Develop Skills in Digital Logic and Oscillator Design.Implement Boolean logic using basic gates (	PO1, PO2	PSO6	PEO1, PEO2	x
B.Sc. Part III Paper I: Quantum Mechanics				
1. Bridging the Gap between Classical and Quantum Mechanics.	PO1, PO2	PSO7	PEO1, PEO2	Understand & Analyze (Medium)
2. Formulate the general wave equation for matter waves and derive the time-dependent and time-independent Schrödinger equation.	PO1, PO2	PSO7	PEO1, PEO2	Analyze & Create (High)
3. Investigate various potential configurations (step, well, barrier) and understand their impact on particle behavior.	PO1, PO2	PSO7	PEO1, PEO2	Analyze & Evaluate (Medium)
4. Formulate the Schrödinger equation in spherical coordinates for the one-electron atom and separate it into radial and angular variables.	PO1, PO2	PSO7	PEO1, PEO2	Analyze & Create (High)
5. Qualitatively explain the fine structure of atomic spectra and understand the Frank-Hertz experiment.				Apply & Evaluate (Medium)
B.Sc. Part III Paper II: Nuclear and Particle Physics				
1. Demystifying the Nucleus:Analyze Rutherford scattering experiments and understand the basic constituents of the nucleus (mass, size, charge, density).	PO1, PO2	PSO8	PEO1, PEO2	Analyze & Evaluate (Medium)
2. Master the concepts of nuclear fusion and fission, including spontaneous fission and its explanation through the liquid drop model.	PO1, PO2	PSO8	PEO1, PEO2	Analyze & Apply (High)
3. Gain knowledge of particle accelerators and their types (Van de Graaff, linear accelerator, cyclotron, synchrocyclotron, proton synchrotron, betatron), understanding their mechanisms.	PO1, PO2	PSO8	PEO1, PEO2	Understand & Remember (Low)
4. Appreciate the discovery of elementary particles and delve into their classification based on quantum numbers.	PO1, PO2	PSO8	PEO1, PEO2	Understand & Remember (Low)
5. Understand the concepts of the quark model and the "number revolution" related to quarks.	PO1, PO2	PSO8	PEO1, PEO2	Analyze & Evaluate (Medium)
B.Sc. Part III Paper III: Solid State Physics				
1. Explore periodicity in lattices, identify unit cells and primitive cells, understand translation vectors, and classify crystals based on crystal systems and packing fractions.	PO1, PO2	PSO9	PEO1, PEO2	Analyze & Evaluate (Medium)
2. Analyze the formation of bands in solids using the periodic potential and Bloch theorem.	PO1, PO2	PSO9	PEO1, PEO2	Analyze & Apply (High)

3. Explain the phenomenon of thermionic emission and analyze the role of Hall effect in metals.	PO1, PO2	PSO9	PEO1, PEO2	Analyze & Evaluate (Medium)
4. Classify different types of magnetic materials based on their magnetic properties.	PO1, PO2	PSO9	PEO1, PEO2	Analyze & Evaluate (Medium)
5. By grasping the fundamental principles of solid state physics, students will be equipped to understand and develop technologies based on diverse material properties.	PO1, PO2	PSO9	PEO1, PEO2	Apply & Create (High)