M.Sc. Physics Course Outcomes Summary Sheet

Course	Title	Course Outcome 1	Course Outcome 2	Course Outcome 3	Course Outcome 4	Course Outcome 5	Course Outcome 6	Course Outcome 7
M.Sc. Previous	Classical Mechanics and Mathematical Methods in Physics (I)	Utilize Lagrangian and Hamiltonian formalisms to analyze dynamical systems.	Extend Hamilton's principle to nonconservative and nonholonomic systems.	Analyze canonical transformations and integral invariants.	Introduce action-angle variables and analyze their adiabatic invariance.	Master Laplace transforms and apply them to solve differential equations.	Employ tensor algebra in representing physical quantities.	Analyze irreducible representations of finite groups.
M.Sc. Previous	Classical Electrodynamics (II)	Apply methods to solve electrostatic problems involving conducting objects.	Solve boundary value problems in magnetostatics.	Master the multipole expansion technique and analyze energy of charge distributions.	Understand conservation laws and the electromagnetic field tensor.	Analyze plane waves in various media.	Master the Lienard-Wiechert potentials and analyze radiation by accelerated charges.	Understand Cherenkov radiation and scattering phenomena.
M.Sc. Previous	Quantum Mechanics, Atomic and Molecular Physics (III)	Utilize the coordinate representation of operators and interpret time dependence.	Analyze invariance under space and time transformations.	Apply time-independent perturbation theory to various systems.	Delve into systems with identical particles.	Analyze the gross structure energy spectrum of the Hydrogen atom.	Understand relativistic corrections to energy levels and fine structure.	Analyze Alkali spectra and the rotation and vibration band spectrum of molecules.
M.Sc. Previous	Electronics, Numerical Methods, and Computer Programming (IV)	Analyze differential amplifiers and op-amps.	Comprehend the principles and build different types of oscillators.	Construct sequential logic circuits using flip-flops and design counters.	Write Fortran 77 programs using variables, expressions, control structures, etc.	Apply interpolation and numerical methods to solve equations.	Gain basic knowledge of computer architecture, operating systems, etc.	
M.Sc. Final	Advanced Quantum Mechanics and Introductory Quantum Field Theory (V)	Analyze scattering phenomena using differential and total cross sections.	Understand attempts and challenges in formulating a relativistic quantum theory.	Analyze expectation values of coordinates and velocities.	Analyze the classical radiation field and perform Fourier decomposition.	Learn the basics of classical Lagrangian field theory.	Analyze the electromagnetic interaction and gauge invariance, performing covariant quantization.	Apply the S-matrix formalism to analyze scattering phenomena using Feynman diagrams.
M.Sc. Final	Nuclear Physics (VI)	Analyze neutron-proton scattering at low energy.	Explore various experimental techniques for nuclear physics.	Master the principles of the shell model for nuclei.	Study vibrational and collective modes of different types of nuclei.	Analyze absorption and attenuation laws for various phenomena.	Understand the concepts of cross section, partial wave analysis, etc.	Analyze nuclear gamma and beta decay, including electric and magnetic multipole moments, etc.
M.Sc. Final	Statistical and Solid State Physics (VII)	Grasp the concepts of statistical distribution, phase space, density of states, etc.	Utilize partition functions to calculate thermodynamic properties.	Analyze recombination mechanisms, optical transitions, and phenomena like excitons.	Analyze the Fermi-Dirac distribution function and its role.	Investigate different types of magnetism.	Analyze spin waves, their dispersion relation, and experimental determination.	Unravel the mysteries of superconductivity through experimental findings.
M.Sc. Final	Microwave Electronics (VIII)	Choose appropriate waveguide dimensions and excitation methods.	Master various microwave measurement techniques.	Investigate different types of magnetrons and analyze their operating characteristics.	Analyze the avalanche transit time effect and understand the operation of IMPATT and TRAPATT oscillators.	Master the principles of parametric amplification and design parametric amplifiers.	Analyze crucial antenna parameters and fields of different types of antennas.	Explore satellite communication principles, including frequency allocation, orbits, coverage, etc.

M.Sc. Physics Program Summary Sheet:			
S.NO.	Program Outcomes (POs):	Program Specific Outcomes (PSOs):	Program Educational Objectives (PEOs):
PO1/PSO1/PEO1	1. Analyze and solve physical problems using fundamental principles of mechanics, electromagnetism, quantum mechanics, and other relevant physics concepts.	1. Master advanced theoretical concepts in classical and quantum mechanics, electromagnetism, statistical physics, and solid state physics.	1. Graduates will be successful in obtaining employment in physics-related fields or pursuing further studies in physics or related disciplines.
PO2/PSO2/PEO2	2. Apply mathematical and computational methods to model, analyze, and interpret physical phenomena.	2. Develop expertise in experimental techniques for investigating physical phenomena in various areas of physics.	2. Graduates will be recognized for their ability to think critically, solve complex problems, and communicate effectively.
PO3/PSO3/PEO3	3. Design and conduct experiments to investigate physical phenomena, collect and analyze data, and draw valid conclusions.	3. Gain proficiency in computational methods for modeling and simulating physical systems.	3. Graduates will be valued for their ethical conduct and their commitment to the responsible use of scientific knowledge.
PO4/PSO4/PEO4	4. Effectively communicate scientific information using written and oral presentations, technical reports, and visual aids.	4. Prepare for further studies in physics or related fields, or for careers in research, development, or teaching.	4. Graduates will contribute to the advancement of scientific knowledge and the development of innovative technologies.
PO5/PSO5/PEO5	5. Work effectively in teams to solve complex problems and collaborate with professionals from diverse backgrounds.	5. Demonstrate the ability to apply physics knowledge to solve real-world problems and contribute to technological advancements.	5. Graduates will be lifelong learners who continue to expand their knowledge and skills in the field of physics.
PO6/PSO6/PEO6	6. Demonstrate ethical responsibility and awareness of the social and environmental implications of scientific research.		
PO7/PSO7/PEO7	7. Pursue lifelong learning and professional development in the field of physics.		

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

Course Outcomes	Program Outcomes	Program Specific Outcomes	Program Educational Objectives	Level
Paper I: Classical Mechanics and Mathematical Methods in Physics				
Utilize Lagrangian and Hamiltonian formalisms to analyze dynamical systems.	PO1, PO2	PSO1	PEO1, PEO2	Apply (Medium)
Extend Hamilton's principle to nonconservative and nonholonomic systems.	PO2	PSO1	PEO1, PEO2	Apply (Medium)
Analyze canonical transformations and integral invariants.	PO2	PSO1	PEO1, PEO2	Analyze (High)
Introduce action-angle variables and analyze their adiabatic invariance.	PO1, PO2	PSO1	PEO1, PEO2	Analyze (High)
Master Laplace transforms and apply them to solve differential equations.	PO2	PSO1	PEO1, PEO2	Apply (Medium)
Employ tensor algebra in representing physical quantities.	PO2	PSO1	PEO1, PEO2	Apply (Medium)
Analyze irreducible representations of finite groups.	PO2	PSO1	PEO1, PEO2	Analyze (High)
Classical Electrodynamics				
Apply methods to solve electrostatic problems involving conducting objects.	PO1, PO2	PSO2	PEO1, PEO2	Apply (Medium)
Solve boundary value problems in magnetostatics.	PO2	PSO2	PEO1, PEO2	Apply (Medium)
Master the multipole expansion technique and analyze energy of charge distributions.	PO2	PSO2	PEO1, PEO2	Analyze (Medium)
Understand conservation laws and the electromagnetic field tensor.	PO1, PO2	PSO2	PEO1, PEO2	Understand (Medium)
Analyze plane waves in various media.	PO1, PO2	PSO2	PEO1, PEO2	Analyze (Medium)
Master the Lienard-Wiechert potentials and analyze radiation by accelerated charges.	PO1, PO2	PSO2	PEO1, PEO2	Apply (High)
Understand Cherenkov radiation and scattering phenomena.	PO1, PO2	PSO2	PEO1, PEO2	Understand (Medium)
Quantum Mechanics, Atomic and Molecular Physics				
Utilize the coordinate representation of operators and interpret time dependence.	PO1, PO2	PSO3	PEO1, PEO2	Apply (Medium)
Analyze invariance under space and time transformations.	PO1, PO2	PSO3	PEO1, PEO2	Analyze (Medium)
Apply time-independent perturbation theory to various systems.	PO2	PSO3	PEO1, PEO2	Apply (High)
Delve into systems with identical particles.	PO1, PO2	PSO3	PEO1, PEO2	Analyze (High)
Analyze the gross structure energy spectrum of the Hydrogen atom.	PO1, PO2	PSO3	PEO1, PEO2	Analyze (High)
Understand relativistic corrections to energy levels and fine structure.	PO1, PO2	PSO3	PEO1, PEO2	Analyze (High)
Analyze Alkali spectra and the rotation and vibration band spectrum of molecules.	PO1, PO2	PSO3	PEO1, PEO2	Analyze (High)
Electronics, Numerical Methods, and Computer Programming				
Analyze differential amplifiers and op-amps.	PO1, PO2	PSO4	PEO1, PEO2	Analyze (Medium)
Comprehend the principles and build different types of oscillators.	PO1, PO2	PSO4	PEO1, PEO2	Understand (Medium)
Construct sequential logic circuits using flip-flops and design counters.	PO1, PO2	PSO4	PEO1, PEO2	Apply (Medium)
Write Fortran 77 programs using variables, expressions, control structures, etc.	PO2	PSO4	PEO1, PEO2	Apply (Medium)
Apply interpolation and numerical methods to solve equations.	PO2	PSO4	PEO1, PEO2	Apply (High)
Gain basic knowledge of computer architecture, operating systems, etc.	PO2	PSO4	PEO1, PEO2	Apply (High)
	PO2	PSO4	PEO1, PEO2	Understand (Medium)

Advanced Quantum Mechanics and Introductory Quantum Field Theory				
Analyze scattering phenomena using differential and total cross sections.	PO1, PO2	PSO5	PEO1, PEO2	Analyze (High)
Understand attempts and challenges in formulating a relativistic quantum theory.	PO2	PSO5	PEO1, PEO2	Understand (High)
Analyze expectation values of coordinates and velocities.	PO1, PO2	PSO5	PEO1, PEO2	Analyze (High)
Analyze the classical radiation field and perform Fourier decomposition.	PO1, PO2	PSO5	PEO1, PEO2	Analyze (High)
Learn the basics of classical Lagrangian field theory.	PO2	PSO5	PEO1, PEO2	Understand (Medium)
Analyze the electromagnetic interaction and gauge invariance, performing covariant quantization.	PO1, PO2	PSO5	PEO1, PEO2	Analyze (High)
Apply the S-matrix formalism to analyze scattering phenomena using Feynman diagrams.	PO1, PO2	PSO5	PEO1, PEO2	Analyze (High)
Nuclear Physics				
Analyze neutron-proton scattering at low energy.	PO1, PO2	PSO6	PEO1, PEO2	Analyze (Medium)
Explore various experimental techniques for nuclear physics.	PO2	PSO6	PEO1, PEO2	Understand (Medium)
Master the principles of the shell model for nuclei.	PO1, PO2	PSO6	PEO1, PEO2	Understand (Medium)
Study vibrational and collective modes of different types of nuclei.	PO1, PO2	PSO6	PEO1, PEO2	Analyze (Medium)
Analyze absorption and attenuation laws for various phenomena.	PO1, PO2	PSO6	PEO1, PEO2	Analyze (Medium)
Understand the concepts of cross section, partial wave analysis, etc.	PO1, PO2	PSO6	PEO1, PEO2	Understand (Medium)
Analyze nuclear gamma and beta decay, including electric and magnetic multipole moments, etc.	PO1, PO2	PSO6	PEO1, PEO2	Analyze (Medium)
Statistical and Solid State Physics				
Grasp the concepts of statistical distribution, phase space, density of states, etc.	PO1, PO2	PSO7	PEO1, PEO2	Understand (Medium)
Utilize partition functions to calculate thermodynamic properties.	PO1, PO2	PSO7	PEO1, PEO2	Apply (Medium)
Analyze recombination mechanisms, optical transitions, and phenomena like excitons.	PO1, PO2	PSO7	PEO1, PEO2	Analyze (Medium)
Analyze the Fermi-Dirac distribution function and its role.	PO1, PO2	PSO7	PEO1, PEO2	Analyze (Medium)
Investigate different types of magnetism.	PO1, PO2	PSO7	PEO1, PEO2	Understand (Medium)
Analyze spin waves, their dispersion relation, and experimental determination.	PO1, PO2	PSO7	PEO1, PEO2	Analyze (Medium)
Unravel the mysteries of superconductivity through experimental findings.	PO1, PO2	PSO7	PEO1, PEO2	Analyze (Medium)
Microwave Electronics				
Choose appropriate waveguide dimensions and excitation methods.	PO1, PO2	PSO8	PEO1, PEO2	Apply (Medium)
Master various microwave measurement techniques.	PO2	PSO8	PEO1, PEO2	Apply (High)
Investigate different types of magnetrons and analyze their operating characteristics.	PO1, PO2	PSO8	PEO1, PEO2	Analyze (Medium)
Analyze the avalanche transit time effect and understand the operation of IMPATT and TRAPATT oscillators.	PO1, PO2	PSO8	PEO1, PEO2	Analyze (High)
Master the principles of parametric amplification and design parametric amplifiers.	PO1, PO2	PSO8	PEO1, PEO2	Apply (High)
Analyze crucial antenna parameters and fields of different types of antennas.	PO1, PO2	PSO8	PEO1, PEO2	Analyze (High)

Explore satellite communication principles, including frequency allocation, orbits, coverage, etc.	PO2	PSO8	PEO1, PEO2	Analyze (High)