COs First Semester Courses MSc Physics

Semester	**I**
Course Code and Course Name	**MSPH 101: Mathematical Physics**
Course Outcomes	
CO1	Represent functions as Taylor, power and Laurent series, classify singularities and poles, find the residues and use the residue theorem to evaluate a contour integral and real integrals.
CO2	Evaluate integrals of functions or vector-related quantities over curves, surfaces, and domains in two- and three-dimensional space by applying Gauss theorem, Stoke's theorem and Green's theorem.
CO3	Determine eigenvalues and eigenvectors and solve eigenvalue problems and apply principles of matrix algebra to linear transformations
CO4	Understand properties and applications of special functions and their differential equations and apply these to various physical problems such as in quantum mechanics.
CO5	Differentiate between groups; subgroup, cosets, conjugate classes, invariant subgroups and factor group and represent a group in Reducible and irreducible representations.

Semester	**I**
Course Code and Course Name	**MSPH 103: Classical Physics**
Course Outcomes	
CO1	Explain the key concepts and principles of classical physics and Analyse and apply the principles of classical Newtonian mechanics for complex problems in physics.
CO2	Apply the Variational principles to real physical problems and interpret the results.
CO3	Apply critical thinking and problem-solving skills, language and conventions of Classical mechanics with appropriate approximation methods to solve some of the real-world problems.
CO4	Model mechanical systems, both in inertial and rotating frames, and setup equation of motion using Lagrange and Hamilton equations.
CO5	Set up and solve the appropriate mathematical equations, and make quick and easy checks on the answer to catch simple mistakes.

Semester	I
Course Code and Course Name	**MSPH 105: Quantum Mechanics**
Course Outcomes	
CO1	Explain the key concepts and principles of quantum physics and solve the Schrödinger equation for standard systems with both analytical and numerical methods, and then interpret the results.
CO2	Relate the matrix formalism to the use of basis states, and solve simple problems in that formalism.
CO3	Test the theory of angular momentum and many particle physics through some selected problems in quantum mechanics
CO4	Anticipate the use of commutation relations to explain the outcome of measurements
CO5	Apply the tools, methodologies, language and conventions of quantum physics with appropriate approximation methods to solve some of the real-world problems

Semester	I
Course Code and Course Name	**MSPH 107: Applied Optics**
Course Outcomes:- After the completion of the course student will be able to:	
CO1	Describe the phenomenon of wave propagation in different geometries of waveguides.
CO2	Use the concept of Diffraction and its significance.
CO3	Describe Fourier optics and Holography.
CO4	Analyze the concept of Coherence.
CO5	Describe the concept of Interferometry.

Semester	I
Course Code and Course Name	**MSPH 109: Electronics**
Course Outcomes	
CO1	Explain the basic properties of semiconductors including the band gap, charge carrier concentration, doping and charge carrier injection/excitation.
CO2	Analyse the characteristics of various electronic devices like diode, transistor etc., and able to classify and analyse the various circuit configurations of BJT and FET.
CO3	Design circuits for various mathematical operations using Op-Amps and illustrate the design of circuits for Voltage regulations.
CO4	Explain the working and design of various encoder/decoders, multiplexers, flip-flops, registers and counters.
CO5	Analyse, design and implement sequential logic circuits for various applications.

COs Second Semester Courses MSc Physics

Semester	**II**
Course code and Course Name	**MSPH 102: Advanced Quantum Mechanics**
Course Outcomes	
CO1	Obtain the working knowledge of four vector space in context to relativistic quantum mechanics
CO2	Explain the key concepts and principles of relativistic quantum mechanical equations, namely, Klein-Gordon equation and Dirac equation
CO3	Deduce the classical and quantum field equation and describe second quantization and related concepts
CO4	Explain the formalism of relativistic quantum field theory. Draw and understand the Feynman graphs for different interactions
CO5	Apply the language and conventions of relativistic quantum mechanics to understand the quantum theory of radiation

Semester	**II**
Course code and Course Name	**MSPH 104: Statistical Mechanics**
Course Outcomes	
CO 1	Apply the knowledge of fundamental concepts such as phase space, ensembles, probability distributions, and partition functions.
CO 2	Apply statistical methods to describe the behaviour of large systems composed of many particles, such as gases, liquids, and solids.
CO 3	Understanding the impact of analyzing various quantum systems, including ideal gases, quantum liquids, and solids, using quantum statistical mechanics principles.
CO 4	Demonstrate a deep understanding of non-ideal behaviour in physical systems, including deviations from ideal gas behaviour, interactions between particles, and the impact of external factors such as pressure and temperature.
CO 5	Apply statistical methods such as fluctuation-dissipation theorem, correlation functions, and power spectra analysis, to study and quantify fluctuations in various physical systems.

Semester		II
Course code and Course Name		**MSPH 106: Computational Methods**
Course Outcomes		
CO1	To develop the ability to approximate the complex problem into well-known numerical form	
CO2	To develop the ability to analyse the variety of errors involved in the problem solving process in order to realize the accuracy of complex solutions	
CO3	To apply the problem solving skill to implement the various numerical algorithms for linear and non-linear equations, data prediction using interpolation and approximation	
CO4	To solve the complicated numerical differentiation, integration and differential equations using numerical methods related to multi-disciplinary complex problems	
CO5	To use the achieved knowledge of this course to design and solve the major-project related activities	

Semester		II
Course code and Course Name		**MSPH 108: Electrodynamics**
Course Outcomes		
CO1	To Understand and analyse Maxwell Equations and its applications	
CO2	To know the Propagation, reflection, and transmittance of EM waves	
CO3	To Evaluate and create relativistic formulation of equations of electrodynamics	
CO4	To Analyse the Motion/Dynamics of Charge particle in electromagnetic field	
CO5	Application of equations of electrodynamics in generation/creation of EM wave as radiation	

Semester		II
Course code and Course Name		**MSPH 110: Solid State Physics**
Course Outcomes		
CO1	To create basic knowledge of crystal systems, spatial symmetries, diffraction phenomena, reciprocal lattices	
CO2	To understand concept of structure factor, scattering, structural analysis and Brillouin zones for scientific, engineering and technological aspect of materials	
CO3	To impart the knowledge of interatomic forces, bonds, dislocations and imperfection in materials	
CO4	To gain knowledge of free electron theory, periodic potentials, band structures, effective mass and importance of Kronig-Penny model	
CO5	To impart the knowledge, principle of magnetism and superconductivity of materials and their industrial and social applications	