SEMESTER I

PAPER: MDC-1/MDC Minor-1: BASIC PHYSICS-I

This course provides students with essential mathematical tools and principles in mathematical physics and classical mechanics. By the end of the course, students will understand the SI system of units, dimensional analysis, vector algebra, and vector analysis. They will be able to solve ordinary differential equations and work with different coordinate systems. Additionally, they will grasp the fundamentals of classical mechanics, including Newton's laws, conservation of momentum and energy, central forces, and the motion of particles in various force fields. The course equips students with critical problem-solving skills, preparing them for further studies and applications in physics, engineering, and scientific research.

PAPER: SEC-1: INTRODUCTION TO COMPUTER PROGRAMMING AND GRAPH PLOTTING

By the end of this course, students will be proficient in graph plotting using GNUPLOT, capable of representing 2D graphs of functions and data files. They will learn to customize plot styles, set plot ranges, and label axes using various options and commands.

Additionally, students will gain a strong foundation in programming with Python (Version 3.x). They will be able to use Python as a calculator, understand variable types, perform basic mathematical operations, and work with compound statements like conditionals (if, elif, else) and loops (for, while). Students will learn how to define and use user-defined functions, lambda functions, and import modules like math and cmath. They will be familiar with reading and writing files in Python.

Furthermore, students will be well-versed in Python's data types, including lists, tuples, and strings. They will understand list methods, list comprehension, tuple packing and unpacking, and various string operations such as indexing, slicing, and string concatenation. The course prepares students with essential programming skills for data analysis, numerical computation, and further studies in Python and related fields.

SEMESTER II

MDC-2/MDC Minor-2: BASIC PHYSICS - II

By the end of this course, students will have a deep understanding of electrostatics and thermodynamics.

In electrostatics, students will grasp the fundamentals of Coulomb's law, electric fields, electric flux, Gauss' law, and the conservative nature of electrostatic fields. They will learn about charge distributions with spherical, cylindrical, and planar symmetry and apply Gauss' law to calculate electric fields in such distributions. Students will comprehend concepts like electric potential, equipotential surfaces, and the potential and field due to physical dipoles. They will also explore capacitance, mechanical forces on charged conductors, and energy stored in electrostatic fields.

In thermodynamics, students will learn the kinetic theory of gases and its relation to macroscopic state variables. They will understand the zeroth and first laws of thermodynamics, internal energy, work, heat, and various processes. The second law of thermodynamics, entropy, and its relation to reversible and irreversible processes will be studied. Students will explore the concept of entropy, Clausius theorem, and temperature-entropy diagrams. The course also covers the third law of thermodynamics and the principle of increase of entropy.

Overall, this course equips students with the knowledge and analytical skills to analyze electrostatic phenomena, thermodynamic processes, and their applications in various scientific and engineering domains.

IDC (INTERDISCIPLINARY): FRONTIERS IN PHYSICS

By the end of this course, students will gain a comprehensive understanding of various scientific principles and their applications in the natural world.

They will learn about the nature of science, the importance of proper reasoning and experiments, and the distinction between science and pseudoscience. Students will explore the Copernican revolution, Kepler's laws, the Solar system, and the birth of Telescopic Astronomy. They will study modern observations of stars, galaxies, and the life cycle of stars. Additionally, they will be introduced to the concept of the Big Bang, Hubble expansion, dark matter, and dark energy.

The course covers the physical basis of the Periodic table, kinetic theory of gases, laws of thermodynamics, entropy, and the basics of radioactivity and X-rays. Students will also learn about the structure of the atom, including electrons, protons, and neutrons, and the Standard Model of particles and interactions.

Furthermore, students will be familiarized with fundamental forces like gravitation, electricity, magnetism, and light, as well as the principles of Quantum Mechanics and the special and general theories of relativity, with an emphasis on qualitative understanding without complex mathematical derivations.