1.	Title of the course	Foundations of Theoretical Physics
2.	Course number	PH703L
3.	Structure of credits	4-0-0-4
4.	Offered to	PG
5.	New course/modification to	Modification To PH7103/9
6.	To be offered by	Department of Physics
7.	To take effect from	July 2022
8.	Prerequisite	Nil
9.	**Course Objective(s):** To provide brief insights into essential elements of theoretical physics. It broadly covers four basic areas: classical mechanics, classical electrodynamics, quantum mechanics and statistical mechanics.	
10.	**Course Content:** Mechanics in non-inertial frame, fluid mechanics, Lagrange and Hamiltonian formalism, conservation laws and symmetry, central force, theory of relativity, chaos theory. Maxwell's equations, multipole expansion, wave equation, Poynting theorem, Fresnel equations, retarded potentials, electromagnetic field transformations, Jefimenko's equation. Generalized uncertainty principle, Schroedinger, Heisenberg and Dirac pictures, correlation, entanglement, Bell's inequalities, path integrals, spectroscopy and scattering theory, many body theory, relativistic quantum mechanics. Microstate, macrostate, ergodicity, ensembles: partition function and probability distribution, thermodynamic potential, entropy, quantum statistics: density operator, von Neumann entropy, statistics of Bosons and Fermions, interacting systems, phase transitions, laser cooling, Bose-Einstein condensate.	
11.	**Textbook(s):** 1. Goldstein H, Poole C P and Safko J, *Classical Mechanics*, Pearson (2012). 2. Sakurai J J, *Modern Quantum Mechanics*, Pearson Education India (2013).	
12.	**Reference(s):** 1. Bransden B H and Joachain C J, *Quantum Mechanics*, Pearson (2008). 2. Jakson J D, *Classical Electrodynamics*, Wiley (2007). 3. Pathria R K and Beale P D, *Statistical Mechanics*, Academic Press (2011). 4. Rana N and Joag P, *Classical Mechanics*, McGraw Hill Education (2017).	