Semester	JAN 2022
Open to semester	6,12
Course code	**PH3234**
Course title	**Statistical Mechanics I**
Credits	4 /
Course Coordinator & participating faculty (if any)	Bijay Kumar Agarwalla
Nature of Course	Lectures
Pre-requisites	Basic working knowledge in classical and quantum mechanics
Objectives (goals, type of students for whom useful, outcome etc)	Objectives: The objective of this course is to introduce the microscopic formulation of thermodynamics for both classical and quantum systems. Outcomes: Upon completion of the course, the students should have a clear understanding of the basic principles governing statistical mechanics, and the connection with macroscopic thermodynamics. Students should also be able to use these ideas to calculate the statistical properties of simple systems.
Course contents (details of topics /sections with no. of lectures for each)	Probability, Random variables, Central limit theorem, laws of large numbers, Principle of Statistical Mechanics: Ergodic hypothesis, postulate of equal apriori probability, phase space, Liouville's theorem, BBGKY Hierarchy, Boltzman equation, H theorem [11 lectures] Three ensembles: Microcanonical Ensemble, Canonical Ensemble, Grand Canonical Ensemble, fluctuations, [9 lectures] Examples: Ideal gas, Mixing entropy, Classical spins, Paramagnetism, Ferromagnetism, Curie's law, Interacting particles, Cumulant Expansion, Cluster expansion [9 lectures] Quantum Statistical Mechanics: density matrix, Liouville equation, Ensembles, Quantum Ideal gas, Bose and Fermi statistics, Black-body radiation, vibrations of a solid, Bose Einstein Condensation [9 lectures]
Evaluation /assessment	End-Sem Examination-35% Mid-Sem Examination-35% Others-2 quiz with 15% each%

Suggested readings (with full list of authors, publisher, year, edn etc.)	[1] Statistical Physics of Particles: Tehran Kardar (2007) Cambridge University Press [2] Statistical Mechanics : R. K. Pathria (1996) 2nd Edition, Butterworth-Heinemann [3] Statistical Mechanics: K. Huang (1987) 2nd Edition, Wiley [4] Fundamental of Statistical and Thermal Physics: F. Reif (2008) Waveband Pr Inc