CURRICULUM DEVELOPMENT PLAN: Dr. V. Bhasker Raj

B.Sc. (H) Physics VIIIth Semester (Even Semester, 2025-2026)

Paper: Advanced Statistical mechanics; Credit: 04 (Lecture-03, Tut.-01)

Topics	Allocation of Lectures (hrs)	Month Wise schedule	Tutorial/assignment/ Presentation etc.
Unit 1: Review of Microcanonical and Canonical Ensembles Macrostates, microstates, phase space, microcanonical ensemble (no derivation), partition function and its use in finding various thermodynamic quantities (no derivation). Examples of systems with finite and infinite energy levels using microcanonical and canonical ensemble approaches.	08	January-February	• Syllabus Overview • Reference Books • Derivations • Problem-solving • Students' difficulties
Unit 2: Grand Canonical Ensemble Equilibrium between a system and a particle-energy reservoir, a system in grand canonical ensemble, physical significance of various statistical quantities, density and energy fluctuations in grand canonical ensemble: correspondence with other ensembles, relation between canonical partition function and grand canonical partition function.	12	February-March	• Derivations • Problem-solving • Students' difficulties
Unit 3: Quantum Mechanical Ensembles. Basic idea of quantum-mechanical ensemble theory. Density matrix of microcanonical, canonical and grand canonical ensembles, Particle in a box and quantum harmonic oscillator	13	March-April	• Derivations • Problem-solving • Students' difficulties • Class Test • Previous year's Question Papers