BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
K K BIRLA GOA CAMPUS
Instruction Division
First Semester 2018–2019
Course Handout

Date 02/08/2018

Course No. : **PHY F312**

Course Title : **Statistical Mechanics**

Instructor-in-Charge : CHANDRADEW SHARMA

Course Description: Statistical mechanics is the combination of statistics and probability theory and the laws of physics. The law of physics mainly deals with a single state, whereas statistical mechanics deals with a large collection of various states. The ensemble average of various states explains many phenomena at macroscopic level (thermodynamics); it , therefore, relates thermodynamics to microstates.

The study of systems consisting of many particles is the most active area of research today. In my opinion, statistical mechanics is the most powerful tool to solve many real life problems.

Scope and Objective: This course deals with equilibrium statistical mechanics. Elements of ensemble theory are discussed. Link between microscopic and macroscopic picture is discussed…

Text Books: T1. Statistical Mechanics, 3rd Edition, R. K. Pathria & P. D. Beale.

Reference Books: R1. Statistical Mechanics, Second Edition, Kerson Huang,
R2. Fundamental and Thermal Physics Federick. Reif,
R3. Heat and Thermodynamics, Mark W. Zemansky and Richard H. Dittman,
R4.Elementary Statistical physics, Charles kittel.

Class schedule: Lecture on M W F 5 at 12 noon. Venue: C-308 and Tutorial T10: Tuesday at 5 PM. Venue: C-305

Lecture No.	Learning Objectives	Topics to be covered	Reference
1.	Introduction	Brief introduction about the course	Lecture notes
2-4	Thermodynamics I	Zeroth law of thermodynamics, First law of thermodynamics, Second law of thermodynamics, Entropy	R3/Lecture notes
5-8	Thermodynamics II	Thermodynamic potential, Maxwell relations	R3/Lecture notes
9-15	Thermodynamics III	Ideal Gas, Real Gas, Phase Transitions, Phase equilibrium	R3/ Lecture notes
16-20	Distributions	Probability, Enumeration and various distributions	Lecture notes

21-22	Some important mathematics	Lagrange multiplier, Sterling approximation,	Lecture notes
23-28	Ensemble Theory	Phase space, Liouville's Theorem, microcanonical ensemble, canonical ensemble, equipartition theorem, virial theorem, grand canonical ensemble, quantum mechanical ensemble, density matrix,	T1(1,2,3,4,5)
29-33	Classical systems	The classical ideal gas, The classical partition function, Maxwell Distribution, monoatomic gas, diatomic gas, real gas.	Lecture notes
34-38	Ideal Bose systems	Bose- Einstein distribution, ideal Bose gas, black body radiation, Bose-Einstein condensation	T1(7)
39-43	Ideal Fermi systems	Fermi-Dirac Distribution, Ideal Fermi gas, magnetic behavior of ideal Fermi gas, electron gas in metals,	T1(8)

Evaluation Scheme [OB: Open book, CB: Closed book]:

Sr.No.	Evaluation Components	Duration	Weightage	Date & time	Nature
1	Attendance		1. 5% (Attendance(L+T) >85 %) 2. 2% (75 %< Attendance (L+T) <85%) 3. 1% (65% <Attendance (L+T) < 75%) 4. 0% (Attendance(L+T) < 65%)	Lec: M W F 12 noon & Tut: 5 pm	
2	Assignments/Projects		10%		OB
3	Surprise Quizzes		15%		CB/OB
4	Mid sem exam	90 min	30%	8/10/18 (2-3.30 pm)	OB
5	Comprehensive exam	180 min	40%	11/12/18 (FN)	CB

Chamber Consultation Hours: 12 to 1 PM, Thursday. B319
Notices: See moodle **LMS**
Make-up Policy: Make-up in exams will be given only in genuine cases, that is, illness leading to hospitalization.

Instructor-in-charge
Chandradew Sharma