BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
Instruction Division
Second Semester 2016–2017
Course Handout (Part II)

Date: 02.08.2016

In addition to Part I (General Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course.

Course No. : PHY F312
Course Title : Statistical Mechanics
Instructor-in-Charge : **Aravinda Raghavan**

I. Course Description :

Statistical mechanics is a great achievement of the human mind and forms an important pillar on which physics stands. While classical mechanics deals with macroscopic objects and quantum mechanics deals with microscopic objects, statistical Mechanics concerns the physical description of a large collection of objects and their relationship with measurable macroscopic properties. Statistical mechanics helps understand arguably the largest variety of both man-made and naturally occurring phenomena. A few examples are semiconductor diodes, why a protein molecule folds under certain conditions, precision detectors, the origin of White dwarfs and other astrophysical objects, phase-equilibrium of mixtures. In this course, the rudiments of this subject will be taught and their application will be shown through illustrative examples.

II. Learning outcomes

A. Understanding the different statistical ensembles and their distribution functions, and applying them to derive thermodynamic potentials, and differentiating their range of applicability.

B. Defining partition function and applying it to solve problems.

C. Applying classical and quantum statistical distributions to a few systems.

D. Recognizing the relationship between equilibrium distributions and kinetic processes leading to equilibrium.

E. Understanding interacting systems and some of the approaches developed to comprehend such systems.

III. Text Books:

1. An Introduction to Thermal Physics, Daniel Schroeder, Pearson, 2014.

Reference Books:

1. Fundamentals of Statistical and Thermal Physics, F.Reif, McGraw Hill International Editions, 1985.
2. Statistical Physics, Landau and Lifshitz.
3. Statistical Physics of Particles, Mehran Kardar, Cambridge University Press, 2007.

IV. Course Plan:

Lecture No.	Topics to be covered
1-5	Review of thermodynamics and Kinetic theory
6-10	Probability Theory
11-15	Classical Statistical mechanics
16-18	Ensemble Theory
19-25	Interacting systems
25-27	Quantum statistical mechanics
28-32	Ideal Bose systems
32-36	Ideal Fermi systems
37-39	Phase transitions
39-42	Kinetics: Fluctuation-Dissipation theorem

V. Evaluation Scheme:

Component	Duration	Weightage (%)	Date & time	Nature
Test 1	60 min	17.5	13th September, 10am-11am	Closed Book
Test 2	60 min	17.5	21st October, 10am-11am	Open Book
Weekly Quiz/Assignments	10 min	15	--	Closed Book
Projects		15	--	Open Book
Comprehensive exam	3 hours	35	14th Dec./Afternoon	Closed Book

VI. Make-up policy:
It is applicable to the following two cases and it is permissible on production of evidential documents.

(i) Debilitating illness.

(ii) Out of station with prior permission from the Institute.

VII. All notices will be displayed on the Physics Group Notice Board.

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Instructor
PHY C312