Introduction to Statistical Physics (Graduate)

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September 4, 2018

Outline

Introduction

- Statistical Mechanics
- Byungjoon Min (S1-1-203), bmin@chungbuk.ac.kr
- Prerequisites: Thermodynamics, Quantum Mechanics, Classical Mechanics, Electrodynamics, and Mathematical Physics.

- Announcement and other communication will be through:
- `http://statphys.chungbuk.ac.kr/doku.php?id=2018asm`

Advanced Statistical Physics + Thermal and Statistical Physics

We have two graduate courses about statistical physics:
“advanced statistical physics” and “thermal and statistical physics”.

Two classes will go together on Tuesday 6-8 (S1-1-205).

Textbook

- Statistical Mechanics: Entropy, Order Parameters, and Complexity, James P. Sethna, Oxford University Press, 2006. (http://pages.physics.cornell.edu/~sethna/StatMech)

Course Objectives

By the end of the course, you are expected to be able to understand

1. Classical Statistical Mechanics
   - Ensemble theory: micro-canonical, canonical, and grand canonical ensembles
2. Quantum Statistical Mechanics
   - Bose-Einstein statistics and Fermi-Dirac statistics
3. Phase Transitions
   - Ising model
4. (optional) Renormalization group or Monte-Carlo simulation.

Grading

final 80 % and attendance & participation 20 %.

Q & A

Any questions?

What is Statistical Mechanics?

- Observable properties of a many-body system
- Large number of particles $\sim 10^{24}$
- By studying the statistics of the probabilistic behavior of its individuals
- Link between macroscopic and microscopic states

- Microscopic states: (x, p) for classical mechanics or $|\Psi\rangle$ for quantum mechanics
- Macroscopic states: T, P, V, N, etc.

Where to go next...

Let us go to the probability and statistics.