Introduction to Statistical Mechanics

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Outline

Introduction

- Statistical Mechanics
- Byungjoon Min (S1-1-203), bmin@chungbuk.ac.kr
- Mon 5 (S1-1-245) and Wed 5-6 (S1-1-336)
- Prerequisites: (essential) Thermodynamics, Quantum Mechanics I, (recommended) Classical Mechanics, Electrodynamics, and Mathematical Physics.

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

- Statistical Mechanics: Entropy, Order Parameters, and Complexity, James P. Sethna, Oxford University Press, 2006. (`http://pages.physics.cornell.edu/~sethna/StatMech`)
- An Introduction to Statistical Mechanics and Thermodynamics, Robert H. Swendsen, Oxford University Press, 2012.
- Thermal Physics, S. J. Blundell and K. M. Blundell, Oxford University Press, 2010.
- Fundamentals of Statistical and Thermal Physics, McGraw-Hill, 1965.

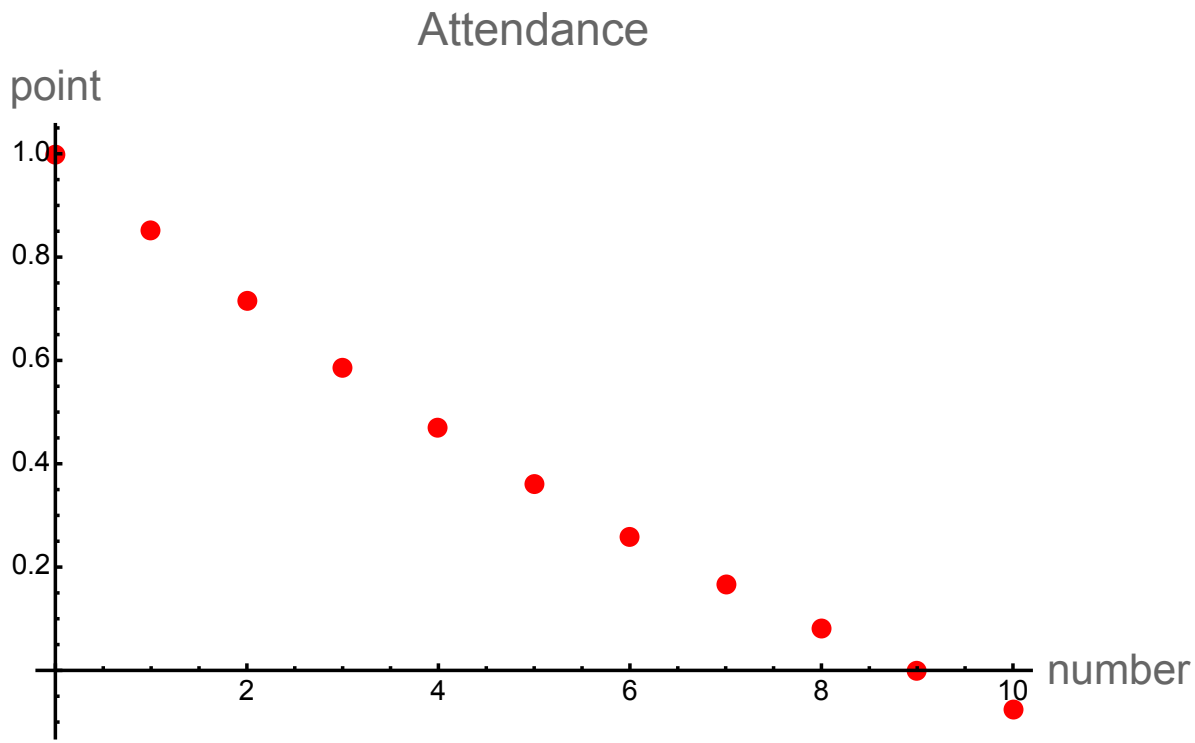
Course Objectives

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

mid 30 %, final 30 %, assignments 30 %, and attendance 10 %.



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.