

Statistical Mechanics PCS 8301 (Fall 2009)

Instructor: M Howard Lee

I. General Information

A. Text

Statistical Mechanics I. M H Lee (2009), second edition

B. Class Attendance--Full attendance expected as well as punctuality.

C. Homework

A set of exercise problems will be given roughly once a week throughout the semester. The homework is to be turned in one week later from the date of receipt. The solutions will be graded A, B and C: A=good, B=acceptable, C=unacceptable.

It is important to do all the homework and do so timely. Failure to submit the homework may result in a failing grade for the course.

D. Exams

Mid-term and Final

Exams will be based on the materials presented at the lectures and covered in the homework.

F. Grades

Provided that all the homework has been submitted, the final grades will be made up by 1/3 from the midterm exam and 2/3 from the final exam. In borderline cases, the instructor will exercise discretion. The grades from the homework and classroom participation will be the main factors.

G. Make-Up Classes

Occasionally the instructor must go out of town to attend conferences, to give seminars and colloquia at other universities.* The missed lectures will be made up on days and times to be agreed upon.

* August 18,20; Septembr 1,3; September 15,17; November 10,12

H. Office Hours

Any time preferably in the afternoon. No appointments needed.

II. Topics (from Table of Contents from Statistical Mechanics I)

Chapter 1. On the foundation of statistical mechanics

Chapter 2. Boltzmann's ansatz or hypothesis on entropy

Chapter 3. Einstein's model in Boltzmann's ansatz

Chapter 4. Einstein's model and formal developments
Chapter 5. Lattice specific heat I. Partition function
Chapter 6. Lattice specific heat II. Debye's theory of solids
Chapter 7. Blackbody radiation and photon gas
Chapter 8. Stephan-Boltzmann law
Chapter 9. Boltzmann's ansatz when there is mixing
Chapter 10. Canonical average: generalization to interacting systems
Chapter 11. Statistical mechanics of magnetism I. Phenomenology
Chapter 12. Statistical mechanics of magnetism II. Paramagnetism
Chapter 13. Statistical mechanics of magnetism III. Ising model

Supplement 1. Review of thermodynamics
Supplement 2. Lagrange Multipliers
Supplement 3. Liouville theorem
Supplement 4. Physics of small oscillations