Northwestern University Department of Physics and Astronomy

Phyx 332-0 STATISTICAL MECHANICS

Spring 2011

Syllabus

Instructor

Ian Low (Office Tech F332)

Course Webpage

`http://www.hep.anl.gov/ian/teaching/Under_SM/Under_SM_Spring2011.html`

Location and Hours

Class: Monday, Wednesday, and Friday 2:00 - 2:50pm, Tech LG76

Discussion: Thursday 10:00 - 10:50am, Tech M120

Office Hours: Thursday 11:00am - 12:00pm or by appointments

Course Description

Physics 332 is an introductory course on thermal and statistical physics. The goal of the course is to learn how macroscopic phenomena can be understood in terms of the relatively simple interactions of large numbers of their constitutive microscopic parts. The course is divided into three sections: introduction, thermodynamics, statistical mechanics. The introduction covers temperature, the ideal gas, entropy and the second law, a statistical definition of entropy, and multiplicity. The second part of the course examines the thermodynamic properties of solids and magnets along with free energy and the chemical potential. In particular, the Helmholtz and Gibbs free energies and their role in understanding phase transitions are presented. The third section of the course is devoted to Boltzmann and quantum statistics. Topics to be covered include partition functions, paramagnetism, equipartition, the Maxwell distribution, and Fermi-Dirac and Bose-Einstein distributions.

Required Textbook

Fundamentals of Statistical and Thermal Physics, by F. Reif, Waveland Press 2009.

Optional Textbooks

- *Statistical Mechanics*, 2nd Edition, by R. K. Pathria, Elsevier 2008.

Exams

- In-class mid-term exam: 2:00 - 2:50pm on Wednesday, April 27th.
- Final exam: 3:00 - 5:00pm on Wednesday, June 8th.

Homework

- Assignments will be posted on the course webpage roughly every week. It is due at 2pm one week from the posted date unless otherwise noted. **NO LATE HOMEWORK WILL BE ACCEPTED**.
- You are required to work on all the assigned problems. However, only a selective number of problems will be graded.
- You are encouraged to discuss with one another about homework assignments. However, after the discussions (which I hope there are plenty!), you must solve the problem youself, write your own solutions, and demonstrate proper understanding of what you write.

Grading

Grades for the assignments and the exams will be posted on the Blackboard. Final grade will be determined by the following formula:

Homework: 35%
Mid-term exam: 30 %
Final exam: 35 %