Physics 30 Spring 2008

Statistical Mechanics and Thermodynamics

Instructor: Kannan Jagannathan
kjagannathan@amherst.edu
Room 228, Merrill
X2346

Meeting Times: Currently set to meet on Thursdays 2 to 3:20 and Fridays 1 to 2:20; we will try for more regular hours when the course meets

Text: *An Introduction to Thermal Physics*, by Daniel V. **Schroeder**, Addison-Wesley (2000); copies available at Jeffery Amherst Textbook Store.

Office Hours: TBA

Outline: The title of the course specifies the main topics to be covered. Our approach will be an integrated one going back and forth between the macroscopic (classical thermodynamics) and the microscopic (statistical mechanics) to the study of the thermal behavior of bulk matter in equilibrium. Except for brief mention, non-equilibrium processes and the transport of energy, momentum, mass etc., will not be studied in detail in this course. The course aims to impart a basic understanding of the laws of thermodynamics, their basis in microscopic laws of physics, and an ability to apply the laws to simple systems such as an ideal gas, paramagnetic solid, an Einstein crystal etc.

Evaluation: As in most physics courses, there will be weekly problem sets, two mid-term tests, and a final that will all contribute to the course grade. Class-participation and citizenship in the course will also play a role in the assignment of a course grade.

Intellectual Responsibility: Collaboration in homework is permitted – even encouraged. However, you should turn in only those solutions that you understand and you should cite any help you received unless it is from the instructor or the assigned text book. On the exams, no collaboration is permitted, and only authorized references may be consulted. When in doubt, check with the instructor or err on the side of caution.

Other References: The subjects covered in this course are vast and have diverse applications in physics, engineering, chemistry, biology, the environment, geology, meteorology, astronomy and cosmology. It would be impossible to do justice to all (or even any) of these areas because of limitations not only of time but also of the competence of the instructor. But there are a number of additional texts that more or less correspond to the level of the course where different topics are pursued in greater depth, or a different treatment of the topics is presented. A short list of such books follows:

1. *Thermal Physics*, Ralph Baierlein, Cambridge University Press (1999).

2. *Statistical Mechanics, A Survival Guide*, Mike Glazer and Justin Wark, Oxford University Press (2001).
3. *Thermal Physics*, 2nd Ed., Charles Kittel and Herbert Kroemer, Freeman Press (1980).
4. *Thermal Physics: Entropy and Free Energies*, Joon Chang Lee, World Scientific, (2002, reprinted in 2004).
5. *Fundamentals of Statistical and Thermal Physics*, F. Reif, McGraw-Hill (1975).
6. *An Introduction to Statistical Physics*, W.G.V. Rosser, Ellis Horwood Publishers, (1982, corrected reprint 1986). Probably out of print.
7. *The Theory of Thermodynamics*, J.R. Waldram, Cambridge University Press (1985, reprinted 1987). Probably out of print.

Some of these books will be placed on closed reserve in the science library for you to consult.