

Physics 227, Spring 2009

Thermodynamics and Statistical Mechanics

Instructor: Andrew N. Jordan

Office: Bausch & Lomb 317

Text: H. B. Callen *Thermodynamics and Introduction to Thermostatistics*

Course Website: <http://www.pas.rochester.edu/~jordan/Phys227/phys227.html>

Class: B&L 270, Tuesday and Thursday 9:40 - 10:55 hours, commencing Thur. 15 January.

Office Hours: Thursday 3:00 - 5:00

Welcome to Statistical Mechanics! The basic plan for the course is outlined below. I will draw mainly from my own lecture notes, but the book above covers the basic material. In addition, there are a variety of books on reserve in the POA library that you may wish to consult. I will post my lecture notes on the blackboard system: <http://my.rochester.edu/webapps/portal/frameset.jsp>

Grades.— There will be homework (40%), a midterm (25%), and a final (35%).

Tentative plan for the course:

Part I: Thermodynamics

Topic 1: Postulates of thermodynamics

Topic 2: Conditions of equilibrium

Topic 3: Examples: Ideal gas, rubber band, ratchet and pawl

Topic 4: Heat and work cycles: Carnot, Otto, refrigerators and heat pumps

Topic 5: Alternative formulations and Legendre transformations

Topic 6: Extremum principles in thermodynamics

Topic 7: Maxwell relations

Topic 8: Stability and fluctuations

Topic 9: Critical phenomena and scaling theory

Topic 10: Transport theory.

Part II: Statistical Mechanics

Topic 1: Statistical reasoning in science

Topic 2: The ergodic hypothesis and chaos theory

Topic 3: The microcanonical formalism

Topic 4: The canonical formalism

Topic 5: The grand canonical formalism

Topic 6: Quantum fluids: Bose and Fermi