Physics 112 Thermodynamics and Statistical Physics Winter 2000

Instructor:	Howard Haber
Office:	Kerr Hall, Room 211
Phone Number:	459-4228
Office Hours:	Mondays and Tuesdays, 2–3 pm
E-mail:	haber@scipp.ucsc.edu
web page:	http://scipp.ucsc.edu/~haber/ph112/index.html

Class Hours

Lectures:	Tuesdays and Thursdays, 10–11:45 am, Kerr Hall—Room 283
Discussion Section:	Wednesday evening [tentative], 6–7:30 pm, Kerr Hall—Room 289

REQUIRED TEXTBOOK:

Thermal Physics, by Ralph Baierlein

Recommended Outside Reading:

Thermal Physics, by Charles Kittel and Herbert Kroemer
Fundamentals of Statistical and Thermal Physics, by F. Reif
An Introduction to Thermal Physics, by Daniel V. Schroeder
Introductory Statistical Mechanics, by Roger Bowley and Mariana Sánchez
Statistical Physics, by F. Mandl
Thermodynamics, Kinetic Theory, and Statistical Thermodynamics,
by Francis W. Sears and Gerhard L. Salinger

COURSE REQUIREMENTS

Course grading

40%	Weekly Homework (8 problem sets)
15%	First Midterm Exam (Tuesday, February 1, 2000)
15%	Second Midterm Exam (Tuesday, February 22, 2000)
30%	Final Exam (Friday, March 17, 2000, 7:30–10:30 pm)

Weekly homework assignments will be handed out each Tuesday and are due at the beginning of class on the Thursday of the following week. The homework problem sets are *not* optional. You are encouraged to discuss the class material and homework problems with your classmates and to work in groups, but all submitted problems should represent your own work and understanding. In order that homework can be graded efficiently and returned quickly, there will be a 50% penalty for late homework. This penalty may be waived in special circumstances if you see me before the original due date. Homework solutions will be made available each Tuesday (following the Thursday due date); no late homeworks will be accepted after that.

The two midterm exams and final exams will be held in the same classroom as the lectures. The final exam will cover the complete course material. You must take the final exam to pass the course.

COURSE OUTLINE

TOPIC	READINGS
1. Thermodynamic Quantities	RB Chapter 1
2. The Second Law of Thermodynamics	RB Chapter 2
3. Entropy and Efficiency	RB Chapter 3
4. Combinatorics and Probability	Boas §16.1–16.8
5. Quantum Microstates and Statistical Mechanics	RB Chapter 4
6. The Canonical Probability Distribution	RB Chapter 5
	RB Chapter 13, pp. 314—326
7. The Planck Distribution: photons and phonons	RB Chapter 6
8. The Chemical Potential	RB Chapter 7
9. The Free Energies	RB Chapter 10
10. Chemical Equilibrium	RB Chapter 11
11. Phase Equilibrium	RB Chapter 12
12. The Quantum Ideal Gas	RB Chapter 8
13. Fermions and Bosons at Low Temperature	RB Chapter 9
14. The Third Law of Thermodynamics	RB Chapter 14
15. Critical Phenomena	RB Chapter 15

The mathematical introduction to combinatorics and probability theory can be found in Chapter 16 of *Mathematical Methods in the Physical Sciences*, by Mary L. Boas. All other readings refer to the textbook by Ralph Baierlein (RB).