## Physics 309 Syllabus

### 8/20/2007

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**Office hours:** call to make sure I am in, TH afternoons till 4:00pm and MWF till 3:15pm. We'll refine this as we learn each other's schedules.

**Text:** *Thermal Physics,* Daniel V. Schroeder, Addison Wesley Longman, San Francisco, 2000

#### Grading:

4 Tests 2 Homework/project <u>2 Final</u> 8

100-87.5	Α
87.5-75	В
75-62.5	С
62.5-50	D
<50	F

#### Academic Regulations:

Regular attendance is expected. Every class is important. Please do not come late. Homework is to be turned in at the beginning of class.

# The syllabus below is subject to change to accommodate instruction and/or student needs.

# Goals:

To understand the physics of large systems - thermal physics

Part I. Fundamentals - temperature, energy, heat and work Part II. Thermodynamics, counting multiplicities, entropy Part III. Statistical mechanics, quantum distribution functions

Emphasis - understanding the basis of thermodynamics and statistical mechanics

Class - Read the book Take notes in class Reread book and annotate notes Work problems Read and understand problems not assigned Ask questions Study

# Project

Each student is asked to complete an independent project. This may involve a long computer problem we haven't done in class, an investigation of the method of solving some of the integrals or identities used in the book, or an in depth study of a topic in the book. These will be written up and provided to the other class members. I have scheduled time at the end of the semester for presenting these orally. I hope we will have time to do so. I'll point out possible topics during lecture but you are free to volunteer for any investigation you are interested in. Please check with me first, however.

## Excel

Several problems require computer computation. All problems can be done using Excel which most of you should have on your computer. If you have not used Excel before, you should locate it on your computer and familiarize yourself with its use. If there is a large portion of the class that does not know how to use Excel, we can have a tutorial out of class. Thomas Jamerson is also a resource.

Date	Chapter	Homework Due
August 20	1.1-1.2 Thermal equilibrium, Ideal gas, Equipartition	
August 22	1.3-1.5, Equipartition, Heat and work, Compression work	Ch1: 1, 4, 7, 10, 13
August 24	1.5-1.6 Compression work, Heat capacities	Ch1 19, 22 a,b,c,d, 25, 28
August 27	1.6 - 2.1 Heat capacities, Two state system	Ch1: 31, 34, 39, 43
August 29	2.2-2.3 Einstein model of solid, Interacting systems	Ch1: 46, 47, 49, 52
August 31	2.4 Large systems	Ch2 1, 4, 7,10
September 5	2.5 - 2.6 Ideal gas, Entropy	Ch2: 13, 16, 19
September 7	2.6 Entropy	Ch2: 21, 24, 28
September 10	3.1 Temperature	Ch2: 31, 34, 37, 40
September 12	3.1 – 3.2 Temperature, entropy and heat	Ch3: 1, 4, 7, 10
September 14	3.2 – 3.3 Entropy and heat, Paramagnetism	Ch3 13, 16, 18
September 17	3.3 Paramagnetism	
September 19	Test Chapters 1 and 2	Test 1
September 21	3.4 Mechanical equilibrium, pressure	Ch3 22, 25
September 24	3.5 Diffusive equilibrium and chemical potential	Ch3: 28, 31
September 26	4.1-4.2 Heat engines, Refrigerators	Ch3 34, 37
September 28	5.1 Free energy	Ch4 1, 3, 5
October 1	Last day to withdraw	
October 1	5.1 - 5.2 Free energy and equilibrium	Ch4: 11, 13, 17
October 3	5.2-5.3 Free energy as force to equilibrium	Ch5: 1, 4, 6, 10
October 5	5.3 Phase transitions	Ch5: 12,13, 20
October 8	5.3 –6.1 Phase transformations, Boltzmann factor	Ch5: 22, 28, 32, 35
October 10	6.1-6.2 Boltzmann factor, Average values	Ch6: 1, 4, 6, 10
October 12	6.2-6.3 Average values, Equipartition	
October 15	Test Chapters 3 - 5	Test 2
October 17	6.4 Maxwell speed distribution	Ch6: 16, 17, 20
October 19	6.5-6.7 Partition function, Composite systems, Ideal gas revisited	Ch6: 25, 31, 38
October 22	6.7-7.1 Ideal gas, Gibbs factor	Ch6: 43, 44, 45, 52
October 24	7.2 Bosons and fermions	Ch7: 5, 7, 9
October 26	7.3 Degenerate Fermi gas	
October 29	Test Chapter 6	Test 3
October 31	7.3 Degenerate Fermi gas	Ch7: 13, 16
November 2	7.4 Black body radiation	Ch 7: 19, 22, 26, 28
November 5	7.4 Black body radiation	Ch7: 28, 29,31,32, read 33
November 7	7.5-7.6 Debye theory of solids, Bose Einstein Condensate	Ch7: 44, 45, 51, 54
November 9	7.6 Bose Einstein Condensate	Ch7: 57, 58, 61
November 12	Bose Einstein problems/Review/Discussion	
November 14	Test Chapter 7 sections 1- 5	Test 4
November 16	Project presentations	
November 19-23	Thanksgiving vacation	
November 26	Project presentations	
November 28	Independent study (ASA meeting)	
December 1	Independent study(ASA meeting)	
December 4	Final Exam (8:00am Tuesday)	