

Physics 410 - 2002

# Thermal and Statistical Physics

*Monday, 6:10 - 7:00 p.m.; Wednesday, Friday, 4:10 - 5:00 p.m., 120 PA*

**Instructor:** Mark Dykman, 203A PA, ph. 353-4861 (o)  
e-mail: dykman@pa.msu.edu  
Office hours: 3:00 – 3:50 p.m. Tuesday, and by appointment

**Grader:** He Lin, 324 PA (to be changed)  
e-mail: lin@pa.msu.edu  
Office hours: 8:00 – 9:00 p.m. Monday, and by appointment

Required Textbook: C. Kittel and H. Kroemer *Thermal Physics*, 2nd edition  
(Freeman, NY 1997).

Optional textbook: L.D. Landau and E.M. Lifshitz, *Statistical Physics*,  
3rd edition, Part 1 (Butterworth-Heinemann, Oxford 1999).

**Grading Scheme:**

weekly problem sets	—	30%
two one hour midterm exams	—	2×15%
a two hour final exam	—	40%.

The final grade will be calculated from the sum of the appropriately weighted percentage for each category, not from grades for each category. There will be extra credit problems on the exams.

**Home assignments** will be given on Wednesdays, and are due a week from the day they are given; late assignments will not be accepted, generally.

**Exams:** First midterm: February 18  
Second midterm: April 10  
Final exam: May 1, 5:45 to 7:45 p.m.

You will be allowed to bring one sheet of notebook paper to use on the exams. The exams will *not* be of the multiple-choice type.

**Schedule conflicts:** I will be out of town the week of Mar. 15-19, and a part of the week of Mar. 22-26. I will arrange for a replacement. Alternatively, we can reschedule the lectures. We will have to find a convenient time or to work later for a couple of days.

**Good luck!**

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## Tentative Schedule

Month	Day	Topic	Chapters
Jan	7 – 11	Introduction. Binary systems	1
Jan	14 – 25	Probability. Average values. Entropy. Laws of Thermodynamics	2 2
Jan	28, 30	Canonical ensemble.	3
Feb	1 – 8	Free energy. Ideal gas.	3
Feb	8 – 15	Harmonic oscillator. Black body radiation.	3, 4
Feb	18	<b>First Midterm Exam</b>	
Feb	20 – 27	The chemical potential. The grand canonical ensemble	5
Mar	1	Fermi-Dirac distribution.	6, 7
Mar	4 – 8	<b>Spring break</b>	
Mar	11	No lecture	
Mar	13, 15	Ground state of Fermi gas.	6, 7
Mar	20	<b>Extra Midterm Exam</b>	
Mar	23– 27	Bose-Einstein distribution. Classical ideal gas.	6, 7
Mar	29	Heat and work	8
Apr	1 – 8	Engines and refrigerators	8
Apr	10	<b>Second Midterm Exam</b>	
Apr	12 – 17	Gibbs free energy. Chemical reactions and phase transformations.	9, 10
Apr	20 – 26	Kinetic theory.	14
May	1	<b>Final Exam</b>	