PHYC 301, FALL 2011

GENERAL INFORMATION

Instructor: Dr. Huaiyu "Mike" Duan, duan@unm.edu, P&A 1144, 505-277-1508
TA: Sajad Abbar, sabbar@unm.edu, P&A 38
Class schedule: 1:00 -- 2:15 PM on Wednesday and Friday, P&A 184
Problem session (PHYC311): 9:00 -- 9:50 AM on Friday, P&A 184. Registering the problem session is **STRONGLY ENCOURAGED**. We will see how the concepts are used by discussing many problems. Some of them are similar to those in the homework, quizzes and exams.
Instructor's office hour: 2:00-3:00 PM on Monday or by appointment, P&A 1144
TA's office hour: 3:30 -- 4:30 PM on Tuesday, P&A 38
MAKE SURE YOU CAN RECEIVE EMAIL FROM YOU UNM ADDRESS.
This course is web enhanced. So check WebCT (http://vista.unm.edu/webct) periodically for resources.

TEXTBOOK AND LECTURE NOTES

We will use *An Introduction to Thermal Physics* by Daniel V. Schroeder (published by Addison Wesley Longman, ISBN 0-201-38027-7) as the textbook.
The notes for lectures and problem sessions will be available at WebCT for download by 5 PM on the class dates.
A few reference books that you may find useful:

- ★ *Fundamentals of statistical and thermal physics* by F. Reif
- ★ *Thermal physics* by C. Kittel & H. Kroemer

HOMEWORK, QUIZZES, EXAMS AND GRADES

There will be one home assignment for (almost) each week. Your grade for homework = (sum of all your homework scores)/(perfect total homework score) × (120/100). There will be **NO MAKEUP ASSIGNMENT**, and **NO LATE ASSIGNMENT** is accepted. The solution for each assignment is posted in WebCT on the due date of the assignment.
There will be a short concept quiz at the beginning of the first class of each week except for the first week and the exam weeks. Your grade for quizzes = (sum of all your quiz scores)/(perfect total quiz score) × (200/100). There is **NO MAKEUP QUIZ**.
There will be **two midterm exams** and a **comprehensive final exam**.
Your final score = (homework grade)×30% + (quiz grade)×10% + (midterm 1 score)×15% + (midterm 2 score)×15% + (final exam score)×30%.
You will receive *Credit* for the problem session as long as you register and show up for more than 60% of the time.

TOPICS

Thermodynamics and *Statistical Mechanics* deal with real world problems. The objects we see everyday consist of large numbers (~10^{23}) of particles. It is impossible to track the position and speed of each particle even with the help of supercomputers. In *Thermodynamics* a system is described by a handful macroscopic quantities such as temperature, pressure, etc that we care about. In *Statistical Mechanics* these thermodynamical quantities are calculated from microscopic physics by using statistics. We will cover most of the materials in the textbook. In the first part of the course we will cover of Chap. 1, 2, 3 and 4. You will learn the four laws of thermodynamics and the most important concept in thermal physics, i.e. entropy. You will understand why heat always flows from hot objects to cold objects and why time goes only in one direction. In the second part of the course we will cover of Chap. 5 and 6. Among other things you will learn phase transitions (e.g. water boils and becomes vapor) and how to do some real calculations. In the last part of the course we will cover of Chap. 7 and 8. In this part you will learn how to treat systems at ultra low temperatures and/or ultra high densities where quantum mechanics applies.

SCHEDULE

Below is a **TENTATIVE** schedule for this semester. Look at the **CALENDAR** in WebCT for the actual schedule.

WEEK	LEC	DATE	TOPIC	BOOK	HW DUE
1	1	8/24	Temperature & pressure, the zeroth law	1.1-2	
	2	8/26	Heat and work, the first law	1.3-6	
2	3	8/31	Entropy, the second law	4.1-2	1
	4	**9/2**	Arrow of time, Boltzmann entropy, paramagnetism	2.1, 2.4.1-2, 3.3	
3	5	9/7	Thermal equilibrium and temperature	2.2-4, 3.1	2
	6	**9/9**	Entropy of the ideal gas	2.5-6	
4	7	9/14	Entropy & heat, the third law, equilibrium	3.2, 3.4-5	3
		9/16	Review		
5		9/21	**MIDTERM I**		4
	8	9/23	Free energies	5.1, 5.2	
6	9	9/28	The van der Waals model, phase transition	5.3.3	
	10	9/30	Chemical potential and phase transitions	5.3	
7	11	10/5	Ideal solution	5.5	5
	12	10/7	Chemical equilibrium	5.6	
8	13	10/12	Boltzmann factor, statistics	6.1-2	6
		10/14	**FALL BREAK**		
9	14	10/19	Equipartition theorem, Maxwell speed distribution	6.3-4	7
	15	10/21	Partition function, paramagnetism revisited	6.5-6	
10	16	10/26	Ideal gas revisited	6.7	8
		10/28	Review		
11		11/2	**MIDTERM II**		9
	17	11/4	Gibbs factor, bosons & fermions	7.1-2	

WEEK	LEC	DATE	TOPIC	BOOK	HW DUE
12	18	11/9	Degenerate Fermi gas	7.3	
	19	**11/11**	Blackbody radiation	7.4	
13	20	11/16	Debye theory	7.5	10
	21	11/18	Bose-Einstein condensation	7.6	
14	22	11/23	Thermal physics in the cosmos		11
		11/25	**THANKSGIVING**		
15	23	11/30	Ising model	8.2	
	24	12/2	Rates of processes	1.7	
16		12/7	Review		12
		12/9	Review		
17			**TBA**		

Important Deadlines:

9/2 Last day to add courses or change sections

9/9 Last day to drop a course without a grade

9/16 Last day to change grading options

11/11 Last day to withdraw without approval of college dean

12/9 Last day to withdraw from a course with approval of college dean