Physics 380: Thermal and Statistical Physics

Gustavus Adolphus College
Fall 2007

Professor: Dr. Thomas Huber
e-mail: huber@gac.edu
Office: Olin 209, 933-7036

Required Textbook:
An Introduction to Thermal Physics, by Daniel V. Schroeder (Addison Wesley, 2000)
Thermal and Statistical Physics Lecture Notes, by H. Gould and J. Tobchnik (Selected chapters)

Recommended References:
Mathematical Handbook of Formulas and Tables, by Murray R. Spiegel (Schaum's)

Course Policies and Evaluation

1. Class Meetings: The class will meet, on average, three days per week 10:30-11:20 AM for lectures, recitations, discussions, demonstrations and exams. Students are expected to have read assigned materials before coming to class (see attached schedule).

2. Homework: Problems sets will be assigned approximately every week (see attached schedule). Written homework sets should be neat and organized. Each student will submit their own assignment, but you are encouraged to discuss the problems with each other.

3. Late Homework: Late homework will be accepted at the discretion of the instructor with some loss of points.

4. Attendance: Students are expected to attend all classes during the scheduled hours. Students are responsible for informing themselves of material and assignments covered during absences. Students must advise the instructor in writing during the first week of class of any scheduled athletic, music, or other college activities that will require their absence during the semester. Such written notice does not imply a waiver of course requirements or an agreement to reschedule exams.

5. Exams: There will be three one-hour exams, and a two-hour written final exam. There will be no separate mid-term exam.

6. Quizzes and Group Problems: There will be a quiz and/or group problem solving sessions some weeks when there is not an exam. Quizzes emphasize problems of a similar nature to material covered in the class or homework. Group problems are often open-ended problems which require incorporation of ideas from different sections of material covered in the class. These quizzes and/or group problems may or

may not be announced in advanced.

7. Project: It is valuable to investigate important implications of statistical and thermal physics in the "real world." In this group project, you will do an in depth study of some application of the material that we will be studying. This will likely require some detailed analytical or computational modeling. You will write a report on this project, and present the results of this project in the final week of the semester. Details will be provided in a separate document.

8. Missed Exams: Students are expected to arrange in writing with the instructor well in advance to take an exam at other than the announced time. Requests to reschedule exams for non-emergency personal reasons will be declined. Permission to make up a missed exam after the fact will be at the discretion of the instructor and should not be assumed.

9. Academic Honesty: As a community of scholars, the faculty and students of Gustavus Adolphus College have formulated an academic honesty policy and honor code system, which is printed in the Academic Bulletin and in the Gustavus Guide. As a student at Gustavus Adolphus College I agree to uphold the honor code. This means that I will abide by the academic honesty policy, and abide by decisions of the joint student/faculty Honor Board.

10. Incompletes: A grade of incomplete will only be given for work not completed due to circumstances beyond the control of the student. (This is the college policy).

11. Evaluation: Hour exams 40%; Homework, Group Problems and Quizzes 25%; Project 15%, Final Exam 20%. Final course grades will be assigned using the following scale as a guide:

94-100	A	74-78	C+
90-94	A-	70-74	C
86-90	B+	66-70	C-
82-86	B	62-66	D+
78-82	B-	58-62	D
0-58	F		

Assignment of the final letter grades will also take into account other factors including the instructor's subjective evaluation of the student's attendance, initiative, evidence of improvement, and the quality of independent work.

Exam Dates

Exam 1: October 16, 2007
Exam 2: November 13, 2007
Exam 3: December 7, 2007
Final Exam: Monday, December 17, 2007, 10:30 AM

Senior Seminar / Statistical And Thermal Physics: Fall 2007

	Monday	Tuesday	Wed.	Thursday	Friday
September	03	04 Therm Equil. & Ideal Gas S: 1.1-1.2 (G&T: Ch 1)	05 *PHY 399*	06 Equipartition, Heat Cap. S: 1.3-1.4	07 *PHY 399*
	10 *PHY 399*	11 Enthalpy and Finish Ch.1 S: 1.5 (G&T: 2.10)	12 *PHY 399*	13 PS1 Binomial Distribution G&T: 3.5 (S: 2.1)	14 *PHY 399*
	17 *PHY 399*	18 Random Walk G&T: 3.5	19 *PHY 399*	20 Continuous Prob. Dist G&T: 3.6-3.7	21 *PHY 399*
	24 *PHY 399*	25 PS2 Einstein Mod., Inter. Sys S: 2.2-3 (G&T: 4.2)	26 *PHY 399*	27 Large Systems S: 2.4	28 *PHY 399*
October	01 *PHY 399*	02 ***Nobel***	03 ***Nobel***	04 Ideal Gas S: 2.5 (G&T 4.3)	05 *PHY 399*
	08 *PHY 399*	09 PS3 Ideal Gas S: 2.5	10 *PHY 399*	11 Entropy S: 2.6 (G&T 4.5)	12 *PHY 399*
	15 *PHY 399*	16 ***Test 1***	17 *PHY 399*	18 Temperature S: 3.1 (G&T 4.5)	19 *PHY 399*
	22 ***Fall Break***	23 ***Fall Break***	24 *PHY 399*	25 Entropy & Heat S: 3.2	26 *PHY 399*
November	29 Paramagnetism S: 3.3 (G&T: pg 163, sect. 5.2)	30 PS4 Pressure S: 3.4 (G&T: 2.17-19)	31 *PHY 399*	01 Chemical Potential S: 3.6 (G&T: 2.17-19)	02 Heat Engines S: 4.1 (G&T: 2.14)
	05 PS5 Refrigerators S: 4.2-4.4 (G&T: 7.4)	06 Free Energy S: 5.1 (G&T:2.21)	07 *PHY 399*	08 Free Energy S: 5.2 (G&T: 7.1-3)	09 PS6 Phase Transformations S: 5.3 (G&T: 7.4-5)
	12 Boltzmann Factor S: 6.1 (G&T: 4.6-8)	13 ***Test 2***	14 *PHY 399*	15 Average Values S: 6.2 (G&T: 6.1-2)	16 PS7 Equipartition S: 6.3 (G&T: 6.3)
	19 Maxwell Speed S: 6.4 (G&T: 6.4)	20 PS8 Partition Function S: 6.5 (G&T: 4.7)	21 ***Thanks.***	22 ***Thanksgiving***	23 ***Thanksgiving***
December	26 Partition Function S: 6.6-6.7 (G&T: 6.1-2)	27 Gibbs Factor S: 7.1 (G&T: 6.6)	28 *PHY 399*	29 PS9 Bosons & Fermions S: 7.2 (G&T: 6.7)	30 Fermi Gas S: 7.3 (G&T: 6.10)
	03 Fermi Gas S: 7.3 (G&T: 6.10)	04 PS10 Blackbody Radiation S: 7.4 (G&T: 6.9)	05 *PHY 399*	06 Debye Model S: 7.5 (G&T: 6.12)	07 ***Test 3***
	10 Bose-Einstein S: 7.6 (G&T:6.11)	11 PS11 Project Presentations	12 *PHY 399*	13 Project Presentations	14 Review

Sections in Parenthesis are Recommended

S == An Introduction to Thermal Physics (Daniel Schroeder, 2000)

G&T == Thermal and Statistical Physics Lecture Notes (Gould & Tobochnik, 2006 version)

Statistical And Thermal Physics: Fall 2007

Problem Sets

PS1 Thursday, September 13, 2007
S: 1.4, 1.12, 1.16, 1.20, 1.42 (Calculate), 1.45, 1.46

PS2 Tuesday, September 25, 2007
G&T: 3.31, 3.34, 3.35, 3.38, 3.40, 3.42, 3.76

PS3 Tuesday, October 09, 2007
S: 2.5abc, 2.7, 2.9, 2.10, 2.17, 2.23, 2.24, 2.26

PS4 Tuesday, October 30, 2007
S: 3.13, 3.16, 3.20, 3.24, 3.25

PS5 Monday, November 05, 2007
S: 3.35, 3.37, 3.39, 4.3, 4.36, G&T: 4.23, 4.24

PS6 Friday, November 09, 2007
S: 5.8, 5.12, 5.13, 5.23, G&T: 2.23, 2.24

PS7 Friday, November 16, 2007
S: 5.32, 5.35, 5.36, 6.2, 6.5, 6.6, 6.12, 6.16

PS8 Tuesday, November 20, 2007
S: 6.20, 6.21, 6.32, 6.36, 6.38, 6.39, 6.41

PS9 Thursday, November 29, 2007
S: 6.43, 6.44, 6.48, 6.52, 7.3, 7.8, 7.10

PS10 Tuesday, December 04, 2007
S: 7.20, 7.22, 7.23, 7.24, 7.28

PS11 Tuesday, December 11, 2007
S: 7.43,7.47, 7.48, 7.53, 7.56, 7.63, 7.66

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