PHYSICS 3610: THERMODYNAMICS

Instructor: Dr. William Robertson

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Office Hours: 9:30 am - 2:00 pm Monday/Wednesday, 11:30 am - 1:30 pm Tuesday/ Thursday

Objective: To provide an introduction to thermodynamics. The course divides into an initial section that covers the essentials of thermodynamics from the applied engineering perspective and a second section that covers the topic incorporating the more fundamental statistical mechanics approach.

Texts: *An Introduction to Thermal Physics* by Daniel V. Schroeder

Fundamentals of Physics by Halliday, Resnick, and Walker

Grading: The course grade will be determined by a combination of homework, two in class tests, and a final exam.

Test 1 25% Test 2 25% Final Exam 25% Homework 25%

To pass the course it is necessary to obtain a grade of C in Test 1 which covers the engineering level Thermodynamics at the level of Halliday and Resnick.

Accommodations: Students with disabilities that may require assistance or accommodation, or if you have questions about accommodations for testing, note takers, readers, etc. you should see me in the first week or two of classes. Students may also contact the Office of Disabled

Student Services (898-2738) with questions.

Note: It is the policy of the Department of Physics & Astronomy that no drops will be approved after the deadline posted in the university's course Schedule Book (after 8th week). The final date for dropping a course with a W for this semester is October 29.

Midterm Grade Reports: The University now requires us to submit an estimated grade during the semester. The midterm grade is my **best** estimate of your progress. It's not a promise or a threat, it's my honest estimate of where you stand at that point. Your final grade may be quite different.

Do you have a lottery scholarship?

To retain Tennessee Education Lottery Scholarship eligibility, you must earn a cumulative TELS GPA of 2.75 after 24 and 48 attempted hours and a cumulative TELS GPA of 3.0 thereafter. You may qualify with a 2.75 cumulative GPA after 72 attempted hours (and subsequent semesters), if you are enrolled full-time and maintain a semester GPA of at least 3.0. A grade of C, D, F, or I in this class may negatively impact TELS eligibility. Dropping a class after 14 days may also impact eligibility; if you withdraw from this class and it results in an enrollment status of less than full time, you may lose eligibility for your lottery scholarship. Lottery recipients are eligible to receive the scholarship for a maximum of five years from the date of initial enrollment, or until a bachelor degree is earned. For additional Lottery rules, please refer to your Lottery Statement of Understanding form, review lottery requirements on the web at http://scholarships.web.mtsu.edu/telsconteligibility.htm, or contact the Financial Aid Office at 898-2830.

Class	Date	Topics	Homework	Due Date
1	T Aug 27	Intro to the Course; Temperature Scales and the Zeroth Law of Thermodynamics; Thermal Expansion	CH 18 # 6, 14, 15, 17, 19	R Sep 5
2	R Aug 29	Temperature and Heat; Heat Capacity and Specific Heat; Thermal Conductivity	CH 18 #23, 30, 32, 33, 38, 39, 41	R Sep 5
3	T Sep 3	Heat and Work; PV Diagrams; Thermodynamic Processes; State Variables; First Law of Thermodynamics; Ideal Gas: Macroscopic Description	CH 18 #51, 57; 42, 43, 49; CH 19 #5, 12, 14	R Sep 12
4	R Sep 5	The Ideal Gas: Microscopic Description; Properties and Processes of an Ideal Gas; Equipartition of Energy	CH 19 #24, 25, 41, 46, 49, 51, 56, 57	R Sep 12
5	T Sep 10	The Carnot Cycle: Heat Engines and Refrigerators	CH 20 #21, 26, 27, 40, 51	R Sep19
6	R Sep 12	Entropy and the Second Law of Thermodynamics	CH 20 #4, 57, 7, 8, 14, 20, 27	R Sep19
7	T Sep 17	An Overview of Introductory Thermodynamics		
8	R Sep 19	**Test 1: Introductory Thermodynamics**		
9	T Sep 24	Heat Capacity, Latent Heat, and Enthalpy	CH 1 #44 (only monatomic and diatomic gases), 45, 51, 57	R Oct 3
10	R Sep 26	Heat Capacity, Latent Heat, and Enthalpy	CH 2 #1,2	R Oct 10
11	T Oct 1	Einstein Solids and Macrostate Probabilities	CH 2 #5(b), 5(d), 6, 9	R Oct 10
12	R Oct 3	(Very) Large System Multiplicities	CH 2 #13, 14, 17, 23	R Oct 17
13	T Oct 8	Entropy and the Second Law	CH 2 #27, 28, 31, 33, 36, 37	R Oct 17
14	R Oct 10	Entropy, Temperature, and Heat	CH 3 #5, 8, 10, 11	R Oct 24
15	T Oct 15	**FALL BREAK**		
16	R Oct 17	Paramagnetism	CH 3 #21, 23, 24	R Oct 31
17	T Oct 22	Mechanical Equilibrium	CH 3 #27, 28, 29, 31, 32, 33	R Oct 31
18	R Oct 24	Diffusive Equilibrium and the Chemical Potential	CH 3 #36, 37	T Nov 5
19	T Oct 29	Real Heat Engines	CH 4 #18, 22, 36	T Nov 5
20	R Oct 31	Helmholtz Free Energy and Gibbs Free Energy		
21	T Nov 5	**Test 2: Schoeder Chs 1-4**		
22	R Nov 7	Free Energy Applied: Examples	CH 5 #2, 5	R Nov 14
23	T Nov 12	Thermodynamic Potentials and Phase Transitions	CH 5 #10, 11, 12, 21, 28, 32	R Nov 21
24	R Nov 14	The van der Waals Equation of State	CH 5 #48, 49, 50	R Nov 21
25	T Nov 19	The Boltzmann Factor and the Partition Function	CH 6 #2, 5, 10	R Nov 28
26	R Nov 21	Average Values and Equipartition	CH 6 #17, 18, 23, 32 (a,b only)	R Nov 28
27	T Nov 26	The Maxwell Distribution Function	CH 6 #33, 34, 35, 39	R Dec 3
28	R Nov 28	The Partition Function and Free Energy and the Ideal Gas	CH 6 #48	
29	T Dec 3	Quantum Statistics: Bosons and Fermions	CH 7 #14	
30	R Dec 5	STUDY DAY		
	Th Dec 12	**Final Exam 1:00 pm- 3:00 pm**		