Physics 309 Thermodynamics

Instructor: Dr. Cecille Labuda
Class time/location: T Th 11:00 – 12:15, Lewis 203
Office hours: MW 09:00 – 9:50 pm Lewis Hall;
By appointment in 1031 NCPA.

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Syllabus version 2: 08/21/2017

Text

Schroeder, Daniel V. An Introduction to Thermal Physics. Pearson Publishing, ISBN-10: 0201380277, ISBN-13: 978-0201380279.
Textbook website:
http://physics.weber.edu/thermal/default.html

Prerequisites / Corequisites

Math 353. Physics 212 or 303.

Description

Thermodynamics is the study of the relations between heat, temperature, work and energy. Matter is treated macroscopically, that is, large collections of particles are studied and the specific composition and microscopic details of the matter are unimportant.

Course Objectives

On completion of this course, students should be able to do the following:

- State the laws of thermodynamics and explain what they mean.
- Explain how temperature and kinetic energy are related.
- Describe the thermodynamic behavior of matter in terms of the kinetic and potential energy of its particles
- Use statistical methods to predict and explain the thermodynamic behavior of materials

Grading Scale

- $92\% \leq \mathbf{A} \leq 100\%$
- $88\% \leq \mathbf{A}- < 92\%$
- $84\% \leq \mathbf{B}+ < 88\%$
- $80\% \leq \mathbf{B} < 84\%$
- $76\% \leq \mathbf{B}- < 80$
- $72\% \leq \mathbf{C}+ < 76\%$
- $68\% \leq \mathbf{C} < 72\%$
- $64\% \leq \mathbf{C}- < 68\%$
- $50\% \leq \mathbf{D} < 64\%$
- $\mathbf{F} < 50\%$

Evaluation and Calculation of Course Grade

A weighted average will be calculated as follows.

Exams (50%)

- 3 closed-book exams.
- Exams with 2 highest grades: 20% each
- Exam with lowest grade: 10%

Homework (25%. Note that the homework grade only counts if exam average is >50% otherwise homework grade is computed as zero)

- Homework sets must be turned in at the beginning of class on the due date. No late homework will be accepted.
- Students are encouraged to work together to solve homework problems, however, no student should copy solutions from another student or from online solutions wholesale.
- Homework solutions must be presented according to the homework rubric. Homework that differs from the rubric in presentation will not be graded.

Exercises (5%)

- There will be in-class exercises and blackboard presentations of problem solutions in some class meetings. Graded for completion.
- There are no make-ups for class exercises.

Final exam (20%)

- The final exam is comprehensive. The format will be similar to the tests

Policies

Attendance

Class attendance is strongly advised. University of Mississippi policy requires that attendance be verified for every student during the first two weeks of classes. In this course, verification will take place on the Monday of the second week of class, therefore all students must be present on that day. Students whose attendance is not verified will be automatically dropped from the course. No make-ups of graded classroom exercises and presentations

will be given except for absences due to verified university sanctioned activities. If you must be absent for tests, it is your responsibility to speak to me before the test to determine whether the absence will be excused and whether the test will be rescheduled. For unexpected test absences, you must contact me by email or telephone within 24 hours after the absence or the test will not be rescheduled under any circumstances

Academic Integrity

Every student of the University of Mississippi, by virtue of choosing to be part of the university community agrees to abide by the University of Mississippi Creed and the UM Academic Integrity Policy which covers academic integrity. Cheating on any assignment is forbidden and, in this course, will result in a zero grade on the given assignment. If a second case of cheating occurs, this will result in an F for the entire course. Please consult the M-Book, Academic Integrity document for details on university policy and the academic creed.

UM Creed

The University of Mississippi is a community of learning dedicated to nurturing excellence in intellectual inquiry and personal character in an open and diverse environment. As a voluntary member of this community:

- I believe in respect for the dignity of each person
- I believe in fairness and civility
- I believe in personal and professional integrity
- I believe in academic honesty
- I believe in academic freedom
- I believe in good stewardship of our resources
- I pledge to uphold these values and encourage others to follow my example

All materials distributed electronically and in hard copy in this class are protected under intellectual copyright. Any attempt to upload these documents onto the Internet (or to distribute them by some other means) or to profit from the distribution (by Internet or other means) of these documents constitutes theft and will be in violation of intellectual property law and the UM Academic Conduct Code unless expressly permitted for by the instructor. Accessing such materials for your own use is also in violation of the UM Academic Conduct Code. Additionally, the distribution of your own class notes via the Internet or other means, or access of such materials, encourages absence from class and is highly discouraged except for occasional loaning of notes to students concurrently enrolled in the class.

University of Mississippi Access and Inclusion

The University of Mississippi is committed to the creation of inclusive learning environments for all students. If there are aspects of the instruction or design of this course that result in barriers to your full inclusion and participation or to accurate assessment of your achievement, please contact the course instructor as soon as possible. Barriers may include, but are not necessarily limited to, timed exams and in-class assignments, difficulty with the acquisition of lecture content, inaccessible web content or the use of non-captioned or non-transcribed video and audio files. Students must also contact Student Disability Services at 662-915-7128 so that office can 1) provide you with an Instructor Notification form, 2) facilitate the removal of barriers and 3) ensure you have equal access to the same opportunities for success that are available to all students.

Audio and video recording

Audio and/or video recording of class lectures is not allowed unless explicit permission is given by the instructor. Permission will only be given if the student has a Student Disability Services request. In such cases, recordings may only be used by the student to whom permission is given and all recordings must be deleted at the end of the semester. Recordings may not be distributed online or elsewhere.

Important Dates

Please see the UM academic calendar (http://registrar.olemiss.edu/fall-2017/)

Examinations

Test dates and topics are subject to change. The final exam date is fixed and cannot be changed.

Test 1: 09/21
Test 2: 11/03
Test 3: 11/24

Final Exam
Tuesday December 5, noon.

Tentative Course Schedule:

The following schedule is subject to change.

Week	Topic	Textbook Sections
01: 08/21 – 08/25	Thermal equilibrium, ideal gases, equipartition theory, heat and work	Ch 1: 1 -5
02: 08/28– 09/01	Heat capacities, rates of processes, two-state systems, Einstein model	Ch 1: 6 – 7; Ch 2: 1 – 2
03: 09/04 – 09/08	Interacting systems, large systems, entropy	Ch 2: 3 – 6
04: 09/11– 09/15	Entropy, temperature, entropy and heat	Ch 2: 3; Ch 3: 1 – 2
05: 09/18 – 09/22	Paramagnetism	Ch 3: 3
05: 09/21	**Test 1**	
06: 09/25 – 09/29	Mechanical equilibrium, pressure, diffusive equilibrium, chemical potential, heat engines, refrigerators	Ch 3: 4 – 6; Ch 4:1 – 2
07: 10/02 – 10/06	Real heat engines, free energy	Ch 4: 3; Ch 5: 1 – 2
08: 10/09 – 10/13	FALL BREAK	
08: 10/16 – 10/20	Phase transitions of pure substances, Boltzmann factor	Ch 5: 3; Ch 6: 1
09: 10/23 – 10/27	Average values, equipartition theorem	Ch 6: 2 – 3
10: 11/03	**Test 2**	
10: 10/30 – 11/03	Maxwell distribution, partition function, composite systems, ideal gas revisited	Ch 6: 4 – 7
11: 11/06 – 11/10	Gibbs factor, bosons and fermions	Ch 7: 1 – 2
12: 11/13 – 11/17	Degenerate fermi gas, blackbody radiation	Ch 7: 3 – 4
13: 11/20 – 11/24	Blackbody radiation, Debye theory of solids	Ch 7: 4 – 5
13: 11/24	**Test 3**	
14: 11/27 – 12/01	Bose-Einstein condensates	Ch 7: 6