

PHYSICS 410 – THERMAL PHYSICS – FALL 2004
COURSE INFORMATION

Instructor: Victor DeCarlo

Office: 235 Julian

x4652

Office Hours: 3:30-4:30 PM MF

1:00-3:00 PM TR, or by appt.

Required Text: Daniel Schroeder, *An Introduction to Thermal Physics* (Addison Wesley, 2000)

About the course: Thermal Physics deals with the properties and behavior of bulk matter. It encompasses the traditional approach of thermodynamics, which says nothing about the constitution of matter, and the more modern approach of statistical mechanics, which makes predictions based on the assumption that matter is composed of large numbers of particles subject to the laws of quantum mechanics. The central quantities of the theoretical formalism are energy, entropy, and temperature. The full scope of thermal physics is evident in the successful application of its methods to problems in chemistry, biology, geology, and astrophysics.

The prerequisites for this course include a year of introductory physics and a familiarity with the techniques of multivariable calculus (particularly the use of partial derivatives). Much of the early material should be familiar in content and presentation from Unit T of the *Six Ideas That Shaped Physics* curriculum.

Course Goals:

- (1) to help you develop a working knowledge of the basic concepts and techniques of thermal physics;
- (2) to give you the opportunity to apply these concepts to a wide range of problems;
- (3) to introduce new mathematical tools appropriate to the material;
- (4) to provide a classroom environment that facilitates active learning and which is conducive to the free exchange of ideas.

Grading: There will be three exams in the course, including a comprehensive final exam. See the course schedule on page three of this document for dates. The first two exams will each be worth 20% of your course grade; the final exam will be worth an additional 30%. You will be allowed to bring an equation sheet to all exams, but exams will otherwise be closed-book.

We will work through a large number of problems from the textbook. The problems range in difficulty from very easy to rather challenging. Roughly once a week, I will

have you submit solutions to one or two problems for grading. Each of these problems will be graded on a 0-10 scale, with maximum credit given to solutions which are neatly written and follow the problem-solving framework practiced in introductory physics. Late solutions will not be accepted. Your cumulative homework score will be worth 20% of your course grade.

The final 10% of your grade will be based on class participation. I will expect you to come to class ready to discuss the text material and prepared to present solutions to homework problems on the board. Excessive absences will result in a very poor participation score.

Once your cumulative percentage score has been calculated, letter grades will be assigned according to the following grading scale:

| | | |
|------------|------------|------------|
| 93-100 = A | 90-92 = A- | 87-89 = B+ |
| 83-86 = B | 80-82 = B- | 77-79 = C+ |
| 73-76 = C | 70-72 = C- | 67-69 = D+ |
| 63-66 = D | 60-62 = D- | |
| 00-59 = F | | |

CLASS SCHEDULE
(subject to revisions)

| | Monday | Wednesday | Friday |
|---|--|--|---|
| Aug 23 – Aug 27 | | Intro to course | S 1.1, 1.2 P 1.7*, 1.12, 1.14, 1.16*, 1.17(a-c), 1.18 |
| Aug 30 – Sept 3 | S 1.3, 1.4 P 1.24, 1.28 | S 1.5, 1.6 (up to pg 31) P 1.31, 1.36, 1.41, 1.46 | S 1.6 (finish) P 1.49, 1.50, 1.51*, 1.55 |
| Sept 6 – Sept 10 | S 2.1, 2.2 P 2.1, 2.3, 2.5(a,e), 2.6 | S 2.3, 2.4 (up to pg 63) P 2.8, 2.12, 2.13, 2.16 | S 2.4 (finish) P 2.17, 2.18*, 2.22 |
| Sept 13 – Sept 17 | S 2.5 P 2.26 | S 2.6 (up to pg 79) P 2.28, 2.29, 2.33, 2.35 | S 2.6 (finish) P 2.37, 2.42* |
| Sept 20 – Sept 24 | S 3.1, 3.2 (up to pg 95) P 3.1, 3.3, 3.5, 3.8 | S 3.2 (finish), 3.3 (up to pg 103) P 3.10, 3.14*, 3.17 | S 3.3 (finish) P 3.20, 3.21, 3.25 (a-e)* |
| Sept 27 – Oct 1 | S 3.4 P 3.27, 3.28, 3.30, 3.31 | S 3.5 P 3.35, 3.36 | Catch-Up Day |
| Oct 4 – Oct 8 | Exam 1 | S 4.1 P 4.1, 4.2 | S 4.2 P 4.10, 4.11, 4.14 |
| Oct 11 – Oct 15 | S 5.1 (up to pg 156) P 5.1, 5.2, 5.3 | S 5.1 (finish), 5.2 (up to pg 163) P 5.5, 5.10, 5.12, 5.20 | S 5.2 (finish) P 5.14*(a-e), 5.22 |
| Oct 18 – Oct 22 | Fall Break | | |
| Oct 25 – Oct 29 | S 5.3 (up to pg 172) P 5.24, 5.28, 5.29 | S 5.3 (up to pg 174) P 5.32, 5.35, 5.38, 5.42* | Catch-Up Day |
| Nov 1 – Nov 5 | S 6.1, 6.2 (up to pg 233) P 6.2, 6.3, 6.5, 6.10*, 6.15, 6.16 | S 6.2 (finish), 6.3 P 6.17, 6.20, 6.23, 6.26, 6.31 | S 6.4 P 6.33, 6.38, 6.39* |
| Nov 8 – Nov 12 | S 6.5, 6.6 P 6.42*, 6.44 | S 6.7 P 6.45, 6.48, 6.49 | Catch-Up Day |
| Nov 15 – Nov 19 | S 7.1 P 7.2, 7.3, 7.5 | Exam 2 | S 7.2 P 7.8, 7.9, 7.10*, 7.11, 7.13 |
| Nov 22 – Nov 26 | S 7.3 (up to pg 282) P 7.19, 7.22, 7.23*, 7.26 | Thanksgiving Break | |
| Nov 29 – Dec 3 | S 7.3 (finish) P 7.28, 7.29, 7.31, 7.33 | S 7.4 (up to pg 296) P 7.39, 7.42, 7.44, 7.45* | S 7.4 (finish) P 7.48, 7.51*, 7.53 |
| Dec 6 – Dec 10 | S 7.6 (up to pg 319) | S 7.6 (finish) P 7.66, 7.68 | Review Day |
| Final Exam: Thursday, December 16, 8:30-11:30 AM | | | |

Solutions to problems identified with an asterisk (*) are due one week after the assigned date.