

Phys. 1341: Thermodynamics and Statistical Mechanics Spring Term 2013

Dr. Andrew Daley

Contact:

Office: Thaw Hall 208, 624-9024

e-mail: adaley@pitt.edu

Office hours: Thaw 208, Tuesdays 11:00am - 12:00pm and Thursdays 11:00am - 12:00pm.

Please feel free to e-mail me if you'd like to make an appointment to discuss outside of these times. You're also welcome just to drop by my office, and I will either discuss with you immediately, or if this is not possible, then we can make an appointment for a later time.

Organisation:

Lecture times: 09:30 AM-10:45 AM, 300 Old Engineering Hall.

Important course information, including homework assignments and additional lecture notes will be posted on CourseWeb. Please check this site regularly.

Content:

The basic concepts of equilibrium thermodynamics and statistical mechanics will be presented and used to provide an understanding of the thermal properties of macroscopic systems. The connection between the large scale macroscopic description of matter in bulk and the atomic scale statistical description will be stressed. Specific topics will include: (1) The first and second laws of thermodynamics, (2) Equilibrium thermodynamics and the meanings and relationships among heat, work, energy, entropy and free energy, (3) The microscopic, statistical interpretation of entropy connecting microscopic and macroscopic descriptions, and (4) Ensembles and related partition functions. There will be numerous examples of the application of thermodynamics and of statistical physics, including: (1) Heat engines, (2) thermal properties of molecular gases, solids and liquids, (3) thermal properties of simple magnetic systems, (4) quantum (Fermi-Dirac and Bose) statistics with applications to electrons and phonons in solids, special types of stars, photons and quantum gases.

Textbook and other literature:

The textbook for this course is Daniel V. Schroeder, *An Introduction to Thermal Physics* (Addison Wesley Longman, ISBN: 0-201-38027-7). Most of the content of our course is well covered in this book in Chapters 1–3, 4.1– 4.2, 5.1–5.3, 6, and 7. For some sections of the course, I will also provide additional lecture notes via CourseWeb.

Students may also be interested to look up some of the topics we will cover in the book by Kittel and Kroemer, *Thermal Physics*, which contains additional advanced material in the later chapters, and extra applications of the material we will study here.

Homework assignments:

- Homework assignments will typically be posted on Tuesdays on CourseWeb as PDF documents, and will typically be due on the following Tuesday, however due dates may vary and will be clearly marked on the assignment sheet.
- Homework assignments should be either handed directly to me (e.g., during the lecture time), or left under my office door by the evening of the due date.
- If there are exceptional circumstances that prevent you from completing an assignment by the due date, please discuss this with me directly, as this will be treated on a case-by-case basis. In fairness to students completing the assignment on time, late assignments will typically be penalized 20% or more of the corresponding credit. This will automatically be deducted for assignments submitted after the due date without prior permission.
- On regular assignments, students are encouraged to discuss solution methods with each other after they have first attempted the problems individually: discussion with your colleagues can often be one of the best ways to learn. However, each student must write up and present their solutions independently. Copying the solutions of other students is academically dishonest and will not be accepted.

Exams and grades:

- There will be two in-class tests during the semester, on **Tuesday February 5th** and **Tuesday March 26th**, unless otherwise announced in the lecture and via CourseWeb. The material examined in these tests will be everything covered in lectures up to the preceding Thursday.
- There will also be a final examination that covers the material of the entire course.
- The final grade will be computed for each student as the higher score of (i) 40% Final examination + $2 \times 20\%$ for the two mid-term tests plus 20% for regular homework assignments; or (ii) 50% Final examination + 30% for the higher score of the two mid-term tests plus 20% for regular homework assignments. That is, if a student's lowest exam score is in one of the mid-term tests, that test grade will be discarded, and made up by increasing the weight of the other mid-term and the final.

Students with disabilities:

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and the Office of Disability Resources and Services, 216 William Pitt Union, (412) 648-7890/(412) 383-7355 (TTY), as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Academic integrity:

As in any course, the academic integrity guidelines at <http://www.as.pitt.edu/faculty/policy/integrity.html> must be followed, especially in homework assignments and examinations. Violations of these guidelines include bringing unauthorized materials to an exam, obtaining exam materials before the beginning of the exam, cheating during an exam, and posting homework solutions on the web or any discussion board. Such violations may result in a zero score for an assignment or examination, and/or a failing grade for the entire course.

If you have any questions regarding the course, please feel free to contact me.