

Physics 224: Thermal Physics

Syllabus as taught by M. Olmstead, A17

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

Course Goals and Content

This class covers Introductory Thermal Physics from both a macroscopic (thermodynamic) and microscopic (statistical) viewpoint. It covers a wide range of topics, including such practical items as how long it takes to boil a pot of water or how your refrigerator works (at least in theory), some things that don't seem so practical, such as how fast a typical air molecule is moving, and some things you may have wondered about, such as why Seattle's climate is much milder than Minneapolis or why it is colder in the mountains than down at sea level.

Lecture Topics by Week (Chapter in Schroeder):

1. Temperature and Thermal Equilibrium (Preface, 1.1)
2. Ideal gas law; Kinetic theory & Equipartition; First Law (1.2-1.4)
3. Work on ideal gas; Heat Capacity & Latent Heat; Enthalpy (1.5-1.6)
4. Thermal conductivity; Multiplicity; 2-state and Einstein systems (1.7, 2.1-2.3)
5. Second Law; Ideal gas multiplicity (2.4-2.5)
6. Statistical definition of entropy and temperature (2.6, 3.1-3.3)
7. Entropy and Heat; Mechanical equilibrium; Negative temperature (3.4)
8. Chemical potential; Carnot cycle (3.5, 4.1)
9. Heat engines and refrigerators (4.2-4.4)
10. Free energy – available work, equilibrium, phase transitions (5.1-5.3)
11. Boltzmann factor; statistical averages; introduce partition function (6.1-6.2)

Grading and Requirements:

- 9 HW assignments are assigned, but not collected or graded. Completion enters into Poll Everywhere grades (see below).
- 28 Online Learning Opportunities (OLO), each including one question related to the day's topic, plus others that require evidence of reading and thinking about the lecture material.
- Poll Everywhere questions during class. Formative assessments (on that day's lecture material) are graded on completion only. Questions based on the homework (asked on the day HW is due) are graded on correctness.
- 2 Midterm Exams
- 1 Final Exam.

The best 4 of 5 units for calculating the grade each count 25%. These 5 units are: OLO/PE (the best 25 days count), MT1, MT2, half of final, half of final.