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Physics 2541 Thermodynamics & Statistical Mechanics Spring 2025 (2254)

Instructor: Professor Joseph Boudreau

Office: 418 Allen Hall

Course Syllabus

Email: <u>boudreau@pitt.edu</u>

Lectures : Allen Hall 106, Tuesday & Thursday, 9:30-10:45 AM

Office Hours: Thursday 3:30-5:00.

Physics 2541 is an introduction to thermal physics, including topics in classical thermodynamics and topics in statistical mechanics. Thermodynamics describes macroscopic thermal properties of matter such as temperature and pressure, and their dynamics, whereas statistical mechanics explains how these properties and dynamics emerge from a microscopic description of matter.

Topics in thermodynamics include: laws of thermodynamics; work, energy, entropy, and thermodynamic potentials; heat engines and refrigerators; chemical thermodynamics and phase transformations, Maxwell relations, Clausius-Clayperon among others. Topics in statistical mechanics include: microscopic description of entropy, ensemble theory and partition functions; magnetic systems, ideal gases; quantum gases; and other elements of quantum statistical mechanics, and thermodynamics of the early universe.

The main textbook for the course is *Statistical Mechanics by R.K. Pathria* and Paul D. Beale, which is available at the bookstore, but I will draw on other sources at the start of the term as we develop the topic of thermodynamics. My lecture notes will be posted online, and

updated after class, and those will indicate the primary sources that I draw upon. A more comprehensive set of resources for the course can be found <u>here</u>.

Homework is to be turned in each week; please do it in order to pass the exams, and in return we will review and evaluate it with a instructional satisfaction icon, one of the above:

together with feedback on whether we consider it correct and/or what you did wrong, but we do not count it towards the grade. If this seems unusual to you, here is <u>the rationale</u>.

Due dates will be announced in class but generally will be midnight on Fridays. In some cases the homework will include computer exercises which can be undertaken using a programming method or computer algebra system of your choice. Solutions are generally posted shortly after the due date.

The grade is based on two in-class examinations (25% each) and the final examination (50%).

The hour exams shall be held in class on Tuesday, Feb 25 and Thursday, March 20 (To be confirmed). The final examination will be held during finals week, April 24-30.

Reserve Books: In addition to the textbook (Pathria and Beale) is placed on reserve in the Benedum engineering library. Other <u>resources</u> are also being requested to be placed on reserve.

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 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.

A comprehensive description of the services of that office can be obtained at <u>www.drs.pitt.edu</u>

Academic Integrity: Working with other students on homework is highly conducive to learning and is encouraged, but on exams you must work alone, using only designated resources. Normally this precludes the use of connected devices. The academic integrity policy of the University of Pittsburgh can be found <u>here.</u>

