PHYSICS 430
THERMODYNAMICS & STATISTICAL MECHANICS
SPRING 2025
Watanabe Hall 114, 9:30am-10:20am
Monday, January 13 – Friday, May 16
Last Day of Instruction / Wednesday, May 7

Instructor
Dr. Chester Vause
Professor, Department of Physics & Astronomy
Watanabe Hall 434, 808-956-2989, cvause@hawaii.edu
Office Hours: After class or by appointment

Prerequisites
"Physics 274, and Math 244 or Math 253A." Note: "A grade of C (not C minus) or better is required in all pre-requisite courses." (Source: University of Hawaii at Manoa Catalog)

Textbooks/References
Primary
Thermal Physics (2nd Edition), Charles Kittel and Herbert Kroemer
Recommended
Introduction to Statistical Physics (2nd Edition), Kerson Huang
Thermodynamics and an Introduction to Thermostatistics (2nd Edition), Herbert Callen
Advanced
Statistical Physics (3rd Edition) Part 1: Volume 5 (Course of Theoretical Physics), L. D. Landau and E. M. Lifshitz
Statistical Mechanics (2nd Edition), Kerson Huang

Course
Lecture material is of primary importance. Topics covered include: the maximum entropy principle, the laws of thermodynamics, the Gibbs probability distributions (microcanonical, canonical, and grand canonical), thermodynamic potentials, Planck, Debye (phonon), Fermi, Bose and Boltzmann ideal gases, paramagnetism, thermodynamic cycles, phase transitions.

Student Learning Objectives
These include:
(1) An understanding of the probabilistic/statistical basis of many-particle macroscopic thermodynamic equilibrium from a microscopic perspective.
(2) The ability to calculate thermodynamic quantities from microscopic statistical mechanical models of macroscopic systems.
(3) To understand the extensive and intensive nature of thermodynamic variables and the relationships amongst these as expressed through partial differential identities, equations of state, and how these are related to physical quantities that may be measured experimentally.

Suggested Problems
Suggested problems will be assigned as needed to give the student practice (not to be turned-in or graded). Some problems will be worked-out in class.

Exams
Exam instructions will be given on the exam cover page, Exams are closed-book, two student-generated notes, paper pages only (not electronic), per new exam material (2 pages for Exam 1, 4 pages for Exam 2, 6 pages for Exam 3, 8 pages for Final Exam), and scientific calculator, only. No internet devices (smartphones, pads, etc.) or electronic storage media. No other sources of material are allowed. By taking the exams, you consent to the conditions set forth. The Exam dates are:

Exam 1	Friday	February 14,
Exam 2	Friday	March 14,
Exam 3	Wednesday	April 16,
Final Exam	Friday	May 16 (9:45am- 11:45am).

Each Exam is based on material covered since the previous Exam (including the Final Exam). Each Exam is worth 1/4 of the final grade total score:

$$\text{Total Score}(\%) = (1/4)*[\text{Exam1}(\%)+\text{Exam2}(\%)+\text{Exam3}(\%)+\text{FinalExam}(\%)]$$

Grade Scale
The Letter Grade for the course is determined from the Total Score(%) according to the following scale:

A- (86%-90%)	A (91%-95%)	A+ (96%-100%)
B- (61%-70%)	B (71%-80%)	B+ (81%-85%)
C- (31%-40%)	C (41%-50%)	C+ (51%-60%)
	F (0%-20%)	D (21%-30%)

NO INCOMPLETE GRADE GIVEN

NOTICE

The Instructor's course lectures and any of the Instructor's written materials (handouts, solutions, etc.) are the intellectual property of the Instructor, and are for your personal use only. It is not to be shared or distributed to anyone, in any form, in any media. No photography, no video, no audio, no electronic recordings of any kind.

Be prepared to take the exams on the assigned dates.*. This is not negotiable. If you have time conflicts, decide if this course is your first priority. I do not "work around" student's personal plans and schedules (work, travel and otherwise).
*(The Final Exam date is set by the University.)