

INTRODUCTION TO THERMODYNAMICS AND STATISTICAL PHYSICS**TTh 2:10-3:25 pm in 210 ROBH**

- Instructor:** Jiong Qiu
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Office hours: TTh 10-11, or whenever available
- Texts:** An Introduction to Thermodynamics and Statistical Mechanics, by Stowe, 2nd edition (required)
Fundamentals of Statistical and Thermal Physics, by Reif (reserved)
Thermodynamics, by Fermi (reserved)
- Web:** <http://solar.physics.montana.edu/qiuj/phys425>
Frequently check this page for detailed course schedule, lecture outlines, reviews, homework assignments, and problem solutions.
- Description:** This course will give a general introduction to thermodynamics and statistical physics, the relationship between macroscopic and microscopic properties of systems comprising many particles. It covers topics of thermodynamics laws, introductory classical and quantum statistics, and simple applications.
- Prerequisite:** PHY-231.
- Homework:** Problem sets are given at every class, due at the following class. Answers will be posted after the due date.
- Exams:** In-class quizzes will be given every other Thursday. The final exam is comprehensive and will be given at **12:00-1:50 on Monday, May 4, in ROBH 210.**
- Grading:** In-class quiz: 50% (the best 5 quizzes will be counted)
Final exam: 30%
Homework: 20%

COURSE OUTLINE AND MORE DETAILED DESCRIPTIONS:

PART I (week 1-8, Stowe: I, III-V; Reif: 2-5; Fermi: I-IV): the translation between microscopic and macroscopic behaviors, introduction to the concepts of **states** and **equilibrium**, **thermodynamic laws**, macroscopic system properties (internal energy, heat, work, temperature, entropy), equation of state, **interactions**, gas models (ideal gas, real gas, general systems), heat engines and refrigerators.

PART II (week 9-15; Stowe: VI, VII; Reif: 7, 9, 8*): introductory statistical mechanics covering basics of statistics, partition functions, **classic statistics**, **quantum statistics** of ideal gas, and simple applications including calculation of thermodynamics properties, kinetics of ideal gas, magnetism, chemical equilibrium, phase transformation, radiation, conduction electrons (not all will be covered, depending on the progress and students' interest).

Preparation and requirement in mathematics:

- Be able to derive partial derivatives with respect to independent variables of commonly used functions such as power, exponential, and logarithmic functions.
- Be able to derive integrals of commonly used functions and perform integration by parts.
- Be very familiar with simple calculations involving exponential functions including some simple forms of integration, derivatives, and approximations using Taylor expansion.