University of Hawaii at Manoa
Department of Mechanical Engineering
ME 611 Advanced Thermodynamics (3 Credits)

Instructor

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Office Hours: Monday 2:00-3:00 pm or by appointment

Course objectives

   This course introduces general principles of classical thermodynamics. Main topics include equilibrium conditions, thermodynamic relations, Legendre transformations, thermodynamic potentials, Maxwell relations, stability of thermodynamic systems, phase transitions, and critical phenomena. By the end of this course, the students are expected to gain advanced knowledge about classical thermodynamics, and should be able to identify and solve real-world and research problems related to classical thermodynamics.

Prerequisites: ME 311; Graduate and senior standing or permission of instructor.

Schedule: MWF 12:30 - 1:20 at Holmes Hall 211

Textbooks: Herbert B. Callen, *Thermodynamics and an Introduction to Thermostatistics*, 2nd ed., John Wiley & Sons, New York, 1985.

Only the Part I of the book, General Principles of Classical Thermodynamics, will be covered.

Schedule of subject

Preface. Review of ME 311
Chapter 1. The problem and the postulates
Chapter 2. The conditions of equilibrium
Chapter 3. Some formal relationships and sample systems
Chapter 4. Reversible processes and the maximum work theorem
Chapter 5. Alternative formulations and Legendre transformations
Chapter 6. The extremum principle in the Legendre transformed representations
Chapter 7. Maxwell relations
Chapter 8. Stability of thermodynamic systems
Chapter 9. First-order phase transitions
Chapter 10. Critical phenomena
Chapter 11. The Nernst postulate *
Chapter 12. Summary of principles for general systems
Chapter 13. Properties of materials *
Chapter 14. Irreversible thermodynamics *
* Only cover if time permits.

Exams and grading

- Weekly homework and class participation   40%
- Midterm exam   30%
- Final presentation   30%