



PHYS4031 Statistical Mechanics

This course provides an introduction to equilibrium statistical mechanics of classical and quantum systems via the theory of ensembles. Topics include: thermodynamic potentials, review on microcanonical ensemble, canonical ensemble, open systems and grand canonical ensemble, Bose-Einstein and Fermi-Dirac statistics and their applications, properties of ideal quantum gases. Elementary thermodynamics and statistical physics of phase transformation and transport phenomena will also be discussed. Students are advised to take PHYS3031 or its equivalents before taking this course. Pre-requisite: PHYS2041 and 2051.

Lecturer

Prof. Xinhui Lu

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Consultation Hour: Stop by any time or make appointment via E-mail

Teaching Assistant(s)

Mr. Chan Pok Fung (Sunny)

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Consultation Hour: Tuesday 09:30 - 11:15

Mr. Yip Chun Ming (Ivan)

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Consultation Hour: Wednesday 14:30 - 16:15

Lecture and tutorial

Lecture:

Tuesday 12:30 - 14:15 (Lee Shau Kee Building LT1)

Thursday 9:30 - 10:15 (Esther Lee Building LT3)

Tutorial:

Thursday 10:30 - 11:15 (Esther Lee Building LT3)

Exercise Class

Monday 09:30 - 10:15 (William Man Wai Mong Engineering Building 804)

Monday 13:30 - 14:15 (Science Centre LG23)

Textbook(s)

See reference.

Reference Books

Statistical Mechanics

F. Reif, Fundamental of Statistical and Thermal Physics, (Waveland Press, 2009). [QC175.R43]

C. Kittel and H. Kroemer, Thermal physics, 2nd ed. (WH Freeman, 1980). [QC311.5.K52]

D. Yoshioka, Statistical Physics: An Introduction (Springer 2007).[Ebook available at CU library]

S. Blundell and K. Blundell, Concepts in Thermal Physics. (Oxford 2006). [Ebook available at CU library]

R. Pathria, Statistical Mechanics, 3rd ed. (ELSEVIER 2011). [Ebook available at CU library]

Thermodynamics

Zemansky, Mark Waldo, Heat and thermodynamics: an intermediate textbook. (McGrawHill, 1981) [TJ265.K7613]

Mathematical Methods

K.F. Riley, M.P. Hobson, S.J. Bence, "Mathematical Methods for Physics and Engineering" (2nd edition) (Cambridge Univ. Press 2002). [QA300.R495 2002]

Assessment Scheme

Homework	30%
Mid-term Test	30%
Final Exam	40%

Course Outline

Please check the Blackboard system for details

1. Introduction

2. Review of Classical Thermodynamics

3. Probability Theory

4. Ensemble Theory - Microcanonical Ensemble, Canonical Ensemble, Grand Canonical Ensemble

5. Applications of Canonical Ensemble

6. Quantum Statistics - Fermi-Dirac, Bose-Einstein, Maxwell-Boltzmann Distribution

7. Ideal Quantum Gases - Ideal Fermi Gas and Ideal Bose Gas

8. Systems with Interacting Particles
