PHY 6500 Thermodynamics and Statistical Physics

LECTURE: TAKESHI SAKAMOTO
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***OFFICE*:** Room 287, Physics Research Building

MEETING TIME: Monday and Friday, 12:50pm ~ 2:50pm
PLACE: Room 0185 in Physics Research Building
Course Ref. No.: 16599
OFFICE HOURS: Friday (10:00am ~ 12:00pm) or by appointment

TEXT BOOK: **Classical and Statistical Thermodynamics, by Ashely H. Carter (Prentice-Hall)**
A copy of the text book has been kept at UGL desk. You can borrow it for a day at a time.

Other References:

- Statistical and Thermal physics: Fundamentals and Applications, M.D. Sturge, CRC Press
- Concepts in Thermal Physics 2nd ED, S.J. Blundell & K.M. Blundell, Oxford
- Thermal Physics by C. Kittel and H. Kroemer, W.H. Freeman and Company

Course requirement: Students are required to take PHY3300 and MAT 2030 before this course (PHY6500).

LEARNING OBJECTS:
In this course, you will learn and be able to

- apply the Law of thermodynamics (0^{th}, 1^{st}, 2^{nd} and 3^{rd}) to a simple system
- understand the definition of temperature, equation of state Carnot's theory, entropy.
- Determine the statistical average and deviations by using Maxwell-Boltzmann distribution
- understand a partition function, heat capacity of solids, and Fermi-Dirac gases

TOPICS TO BE COVERED IN THE COURSE (Guidance only)

Chapter 1. Definitions, temperature and temperature scales.
Chapter 2. Equation of state of an ideal gas and van der Waals gas.
Chapters 3, 4 & 5. Work, heat, internal energy, first law of thermodynamics – applications and consequences.
Chapters 6 & 7. Entropy and the second law of thermodynamics, applications of the combined first and second laws.
Chapter 8. Thermodynamic potentials, Maxwell's relations and applications.
Chapters 9 & 10. Chemical potential and the third law, consequences of the third law.
Chapter 11. Kinetic theory of gases: pressure, equipartition of energy, specific heat capacity.
Chapter 12. Statistical thermodynamics: concepts of thermodynamic probability and

entropy, quantum states and energy levels.

Chapter 13. Quantum statistics: the Boltzman distribution, the Fermi-Dirac distribution and the Bose-Einstein distribution.

Chapter 14. Ideal gas, diatomic gas, applications of the Maxwell-Boltzman distributions.

Chapters 15, 16 & 17. Heat capacity of a solid and the thermodynamics of magnetism.

Chapter 18. Black-body radiation, Bose-Einstein gases.

Chapter 19. Fermi-Dirac gases, free electrons in a metal.

***GRADING DETERMINATION*:** Total points is 100.

Three mid-tern exam	10 points x 3 =	30 points
Homework (about 10 homework)	3 points x 10 =	30 points
Attendance		15 points
Final		25 points
		100 points

Extra points for Homework presentation: 1 point / ea x N

Mid-tern exams are scheduled on 10/3, 10/31, and 11/28.

Course Begin: 9/2 (Fri)
Course end: 12/12 (Mon)
Final Exam: 12/19 Monday, 10:40am ~ 1:10pm, Place: TBD

Points accumulated Percent Grade

Percent	Grade
90-100	A
85 – 89	A-
80 – 84	B+
75-79	B
70-74	B-
65-69	C+
60-64	C
55-59	C-
50-54	D+
45-49	D
40-44	D-
0-39	F