

KING FAHD UNIVERSITY OF PETROLUIM AND MINERALS
DEPARTMENT OF PHYSICS
THERMAL AND STATISTICAL PHYSICS
PHYS 430
SPRING 2018
Course Outline

Credit Hours	: 4
Prerequisites	: PHYS 401 (Q. M. I)
Class	: Lecture: SMTT 12:00 – 12:45 Noon, Room 6-100,
Instructor	: Prof. Dr. Ibraheem M. A. Nasser
Office	: 6-227
Phone	: 2234
Email	: innasser@kfupm.edu.sa
Office Hours	: by appointment

Course Description

Statistical physics, developing both thermodynamics and statistical mechanics simultaneously. Concepts of temperature, laws of thermodynamics, entropy, thermodynamic relations, free energy. Applications to phase equilibrium, multicomponent systems, chemical reactions, and thermodynamic cycles. Application of statistical mechanics to physical systems; introduction to treatment of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics with applications. Computational aspects of free-energy entropy magnetization for various classical and quantum distributions.

Recommended Textbook

- 1- Ashley Carter “Classical and Statistical Thermodynamics”, (Prentice Hall, 2001).

References

- 1- Blundell and Blundell , *Concepts in Thermal Physics*, by, 2nd Edition, Oxford (2009)
- 2- D. V. Schroeder, *Thermal Physics*, Addison Wesley Longman, 2000.
- 3- R. Bowley and M. Sanchez, “*Introductory Statistical Mechanics*”, (Clarendon Press, Oxford) 1999.
- 4- F. Reif, “*Fundamental of Statistical Mechanics and Thermal Physics*”, (McGraw-Hill, New York), 1965.
- 5- F. Mandel, *Statistical Physics*, John Wiley & Sons, 1988.
- 6- Kittel, C. and Kroemer, H. *Thermal Physics* 2nd Edition (Freeman)
- 7- M. Glazer and J. Wark, *Statistical Mechanics, A SURVIVAL GUIDE*, Oxford, 2001.
- 8- Daijiro Yoshioka, [Statistical Physics: An Introduction](#) Springer (2007).
- 9- Harvey Gould and Jan Tobochnik, [Statistical and Thermal Physics:With Computer Applications](#) , Princeton University Press (2010).
- 10- Daniel C. Mattis and Robert Swendsen, [Statistical Mechanics Made Simple](#), second edition, World Scientific (2008).
- 11- A. M. Glazer and J. S. Wark, [Statistical Mechanics: A Survival Guide](#), Oxford University Press (2002).

Course ware of [James J. Kelly](#) at
<http://www.physics.umd.edu/courses/CourseWare/StatisticalPhysics/>

Objectives:

1. To understand the first and second laws of thermodynamics, and associated concepts.
2. To know how to be able to use the formalism of thermodynamics, including the thermodynamic potentials and Maxwell's relations.
3. To understand the statistical origin of the second law of thermodynamics.
4. To know how to construct a partition function and how to use it to obtain thermodynamic quantities of interest.
5. And more

Homework:

A homework assignment will be given every week on each of the chapters covered in the text book. Homework is due at the beginning of each class on the due date; late homework will not be accepted. Problems may be set from the textbook or from the other sources.

Important note: Solutions should be clearly written using word and MATH TYPE5. No Credit will be given for hand writing.

Acknowledgements

You are encouraged to collaborate and to seek help from other students to do the homework, but the final write-up should be your own. If you do obtain help, you should acknowledge it. Such an acknowledgement will not lower your grade.

Examinations:

Three examinations are announced during classes. The exams will be closed book.

Attendance:

Attendance will be evaluated according to the University regulations.

Assessment

Activity	Weight
Weekly Homework Problems	30%
First Major Exam (two hours)	20%
Second Major Exam (two hours)	20%
Final Exam (three hours)	30%

Grading

A ⁺ ≥90	90>A≥85	85>B ⁺ ≥80	80>B≥75	75>C ⁺ ≥70	70>C≥65	65>D ⁺ ≥60	60>D≥50	F<50
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Wish you a successful semester