Course specifications

A- Administrative Information

Program(s) on which the course is given: **Post-graduate in Applied Mathematics.**

Major or minor element of program: **Major**

Department offering the program **Mathematics,**.

Department offering the course: **Mathematics**

Academic year / Level: Pre-Master in Applied Mathematics

Date of specification approval: September 2008

Title: Statistical Mechanics **Code:** M627

Credit Hours: 2 **Lecture:** 2

Tutorial: 0 **Practical:** 0 **Total:** 2

B- Professional Information

1 – Overall aims of course

This is a graduate level course on principles of statistical mechanics and their applications to various physical systems. We will study fundamental principles of thermodynamics and statistical mechanics, including probability theory, entropy, classical statistical mechanics, and ensembles.

2 – Intended learning outcomes of course (ILOs)

a-Knowledge and understanding:

The main goal of this course is to:

a1- display fundamental knowledge of classical statistical mechanics.

a2- apply a bridge between macroscopic thermodynamics and microscopic statistical mechanics by using mathematical methods and fundamental physics for individual particles.

b-Intellectual skills

The Intellectual skills that the students should gain:

b1- interpret how general principles of statistical mechanics work in some simple and complex systems and what powerful notions and ideas have been applied to approach complex cases.

c- Professional and practical skills

Upon completion of the course, students clearly understand basic principles, be able to :

c1• Learn different statistical ensembles, their distribution functions, ranges of applicability and the corresponding thermodynamic potentials.

c2• Make relationship between equilibrium distributions and processes leading to equilibrium.

d-General and transferable skills

d1- Apply the techniques PC and Internet to solve the specific topics related to the course material.

d2- The students' oral communication during presenting their own written reports.

d3- Work effectively the idea of teamwork through assigning a group of students for each.

3- Contents

Topic	**No. of hrs**	**Lecture**

1-**Review of thermodynamics;** -Temperature. -Probability Theory; entropy. -Statistical interpretation of thermodynamics	2 8	1 4
2-**Classical statistical mechanics;** **Microcanonical ensemble** a. Enumeration of microstates b. Large numbers **3-Semiclassical systems** c. Classical phase space d. Entropy e. Maxwell-Boltzmann distribution **4-Canonical ensemble**,	8 6	

4– Teaching and learning methods

4.1- Course notes
4.2- Reports Assignment
4.3- Oral presentations

5- Student assessment methods

5.1 Reports to assess skill of collecting data & ability of team work

5.2 Oral to assess skill of discussing and analyzing the report

5.3 mid-term exam to assess understanding and memorizing skills

5.4 Final term Exam to assess overall performance

Assessment schedule

Assessment 1 : Reports 1report/3 weeks
Assessment 2 : report defense every 3 weeks
Assessment 3 : mid-term 7^{th} week
Assessment 4 : Final term 14^{th} week

Weighting of assessments

20 % Mid-Term Examination
60 % Final-term Examination

10 %	Oral Examination.
10 %	Other types of assessment
100%	Total

Any formative only assessments

N/A

6- List of references

1-S. L. Gupta and I. D. Gupta, Advanced quantum theory and fields, Chand and company Ltd, New Delhi, 1986.

2-

7- Facilities required for teaching and learning

Dark room equipped with overhead projector and LCD projector.

Students' computer Lab. with printing and internet facilities.

Course coordinator: Professor Dr. Aly Maher Abourabia

Head of Department: Prof. Dr. Mohamed A. RAmadan

Date: June 13th, 2010