UNIVERSITY of HOUSTON

COLLEGE OF NATURAL SCIENCES & MATHEMATICS HTTP://NSM.UH.EDU

COURSE TITLE/SECTION: **Solid State Physics II (Physics 7338)**

TIME: 1 – 2:30 PM, Tuesday and Thursday (Spring Semester, 2011)

Instructor: Haibing Peng **OFFICE HOURS**: By appointment.
E-mail: haibingpeng@uh.edu **Phone:713-743-8233 Office: HSC370**

I. Course Catalog Description

7338: Solid-State Physics II: Cr. 3. (3-0). Prerequisite: PHYS 7337. Transport properties, optical processes, magnetic properties, superconductivity.

II. Course Objectives

Upon completion of Phys 7337 and 7338, students will be able to have a comprehensive understanding of modern solid state physics, critical for graduate students working in the areas of semiconductors, magnetic materials, superconductivity and nano-physics.

III. Course Content (Tentative):

Chapter 7 Transport Properties (Continued from Phys 7337)

Classical Drude model, the semi-classical Boltzmann equation, the quantum approach: linear response theory for conductivity and dielectric function.

Chapter 8 Optical Properties of Solid

Macroscopic theory, dispersion and absorption, optical modes in ionic crystals, photon-phonon transitions, interband transitions, interaction with conduction electrons, and the anomalous skin effect.

Chapter 9 Magnetism

Spin and orbital magnetic susceptibility, the Curie-Weiss law and ferromagnetism, exchange interaction and Heisenberg model, band ferromagnetism, antiferromagnetism, the Ising model and the combinatorial method, exact solution of the Ising model in one dimension, spin waves, and the antiferromagnetic ground state.

Chapter 10 Superconductivity

Experimental observation; the London equation; BCS theory; Ginsberg-Landau theory; Flux Quantization; Vortex and type II superconductors; superconducting junctions.

IV. Text Books and References

-Required textbook: J. M. Ziman, "Principles of the Theory of Solids" (2nd Edition, Cambridge University Press)

-Recommended references:

1. E.M. Lifshitz and L.P. Pitaevskii, "Statistical Physics" (part 2)
2. Neil W. Ashcroft, N. David Mermin, "Solid State Physics"
3. Efthimios Kaxiras, "Atomic and Electronic Structure of Solids" (Cambridge University Press, 2003)

V Course Requirement

Quantum Mechanics and Statistical Physics.

A. Reading Assignments

Read the part of the textbook and the provided lecture notes before lecture is given

B. Written Assignments

Homework problems will be assigned for each chapter.

C. Projects (as needed)

There will be no projects

D. Exams (as needed)

There will be one mid term and one final examination in each semester.

Class attendance: Student attendance to all classes is mandatory. A student may be dropped or assigned with a grade F if he or she is absent in more than 5 classes without a valid excuse. For the absence in class with a valid excuse, students must notify the instructor in time.

VII. Evaluation and Grading

Homework counts 20%

Mid term counts 40%

Final counts 40%

85 above = A, 75 - 85 = A^-, 65-74 =B^+, 50-64 =B, 40 - 50 =C, 30-40 =D, below 30 = F.

Policy on grades of I (Incomplete): The temporary grade of I (incomplete) is a conditional and temporary grade given when students (a) are currently passing a course or (b) still have a reasonable chance of passing in the judgment of the instructor, but for non-academic reasons beyond their control have not completed a relatively small part of all requirements. Incompletes will be given only when documentation has been submitted to support the need to receive an incomplete, i.e., medical statements.

VIII. Consultation

Office hours are listed in page 1. (office: HSC 370; phone: 713-743-8233; email: haibingpeng@uh.edu)

IX. Bibliography

See textbook info**.**

The university requires all syllabi to have the following paragraph:

Addendum: Whenever possible, and in accordance with 504/ADA guidelines, the University of Houston will attempt to provide reasonable academic accommodations to students who request and require them. Please call 713-743-5400 for more assistance.

It is each student's responsibility to read and understand the Academic Honesty Policy found in the Student Handbook, which can be found at http://www.uh.edu/dos/hdbk/acad/achonpol.html.

Academic Dishonesty: Please see following website for information regarding academic dishonesty. www.uh.edu/honpol.

Standard Disclaimer: This syllabus is subject to change at the discretion of the instructor.