

**University of Maryland**  
**Dept of Materials Science and Eng.**  
**ENMA460/PHYS431**  
**Physics of Solid Materials**  
**Spring 2015**

**Course description:** Introduction to the behavior of ideal and real materials, and the importance of the structure in this behavior.

**Pre-requisites:** Math 246, Phys 270, 271.

**Text:** Introduction to Solid State Physics, Charles Kittel, 8<sup>th</sup> Edition, Wiley and Sons, 2005. Professor's PDF's will be posted; however, please note that the instructor reserves the right to add any notes that she feels may clarify some of the points given during class on the board – these will **not** be added to the PPT. Recommended; Understanding the Properties of Matter, Michael de Podesta, 2<sup>nd</sup> Edition, Taylor and Francis, 2002, in the reference section of the library, call number ENG40.

**Course Website:** Canvas

**Course objectives:** The students should be able to understand and to describe the physical principles underlying the properties of materials, how does atomic arrangement modify this properties, and which parameters are used to measure these properties in real materials.

**Topics Covered:** Chapters refer to the book by Kittel

- I. Structure of Materials
  - A. Introduction
  - B. Crystal structure (Chap 1)
- II. Structural analysis (Chap 2)
- II. Binding energies (Chap 3)
  - A. Binding energies and the periodic table
  - B. Classification of materials according to the binding energies
- IV; Thermal properties in Solid Materials
  - A. Phonons (Chap 4)
  - B. Thermal properties and their application (Chap 5)
- V. Free Electron Models and Metals (Chap 6)
- VI. Energy Bands (Chap 7)
- VII. Semiconductors (Chap 8)
- VIII. Dielectric materials, others (Various chapters, *if time allows*)

**Course schedule:**

Monday – Wednesday 3:30 – 4:45 PM, RM. 1224 CHM

**Grading Scheme**

Homework and/or reports or if given, quizzes: 20%\*

Midterm: 35% - **Scheduled tentatively for March 4, 2015\*\***

Final: 45% - **Scheduled for Saturday, May 16, 1:30 – 3:30 PM\*\*\***

\*Homeworks will be assigned on a biweekly basis, approximately. Some may take more time, due to the material covered. The instructor may select problems to be graded; however, all problems will be collected. Homeworks may include mini-reports (oral or written) on papers related to the class material. Homeworks must be turned in at 3:30 PM on the day they are due, either in person or via canvas. No late homeworks will be accepted since the solutions will be posted. **No email homeworks will be accepted.**

\*\*The day for the mid-term may move one-half week forward or backwards, as determined by the instructor. But it will probably remain the same.

\*\*\*The final is scheduled by the University Registrar and cannot be re-scheduled. Please contact me if you have religious reasons for not taking it Saturday.

➔ Please turn off all cellphones or Ipads or any other means of social texting or computing, or put the phones in vibration mode. Do not text during class or exams.

**Contribution of course to meeting the professional component:** This course is a required upper level undergraduate course for ENMA students, that covers the basic understanding of structure-property relationships of materials.

**Contribution of course to program objectives:** This is a required course for students in Materials Science and Engineering. Through this course, students will become familiar in the application of physical principles to the study of materials.

**Honor Code:** The University of Maryland, College Park has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit <http://www.shc.umd.edu>.

To further exhibit your commitment to academic integrity, remember to sign the Honor Pledge on all examinations and assignments: "I pledge on my honor that I have not given or received any unauthorized assistance on this examination (assignment)."

**Course Instructor:**

Prof. L. J. Martínez-Miranda

Department of Materials Science and Engineering

RM 1110D CHE (Bldg 090)

Extension: 5-0253; Email: [ljmm@umd.edu](mailto:ljmm@umd.edu)

Office Hours: TBD the second week of classes

Prepared: January 21, 2015

➔ Syllabus will be final the first day of classes. Office hours will be posted the second week of classes.