

Lecture Syllabus

Course title: Electronic Properties of Materials

Course Number: 445.312 (002), **Credits:** 3

Instructor: Prof. Sang-Im Yoo (Rm 131-407, siyoo@snu.ac.kr, Tel : 880-5720)

Prerequisite: Modern Physics of Materials or Introduction to Quantum Mechanics

Class time & room: Mon, Wed – 12:30 ~ 13:45, Rm 33-226

Teaching Assistant: Jae-Hyoung You (Rm 131-414, jh31330@snu.ac.kr, Tel : 880-7443)

Homepage: <http://emdl.snu.ac.kr>

Office hours: Mon, Wed – 14:00 - 15:00

Course Objective

- Understanding the basic concepts of electrical, optical, magnetic, and thermal properties of materials and their applications.

Text: R.E. Hummel, Electronic properties of Materials. 3rd ed. Springer

References:

- Electrons in Solids, 3rd ed., Richard H. Bube, Academic Press,
- Electrical Properties of Materials, 7th ed., L. Solymar, D. Walsh, Oxford Univ. Press
- Introduction to Magnetic Materials, 2nd ed., B. D. Cullity and C. D. Graham, John Wiley & Sons, Inc
- Introduction to Solid State Physics, 8th ed., Charles Kittel, John Wiley & Sons, Inc

Grading:

- 30-min Quiz #1 (10%)
- Midterm exam (25%)
- 30-min Quiz #2 (10%)
- Final exam (35%)
- Homework (20%)

(# absence more than 4 lectures = F)

Lecture Contents

- Chaps. 1-3, Matter Waves & the Schrödinger Equation (Review) (Lect. #1)
- Chap. 4 Solution of the Schrödinger Equation for Four Specific Problems (Review) (Lect. #2 ~ Lect. #3)
- Chap. 5 Energy Bands in Crystals (Lect. #4 ~ Lect. #5)
- Chap. 6 Electrons in a Crystal (Lect. #6)

- 30 min Quiz #1 (2014.09.29, Mon.)
- Chap. 7 Electrical Conduction in Metals and Alloys (Lect. #7 ~ Lect. #9)
- Chap. 8 Semiconductor (Lect. #10 ~ Lect. #12)
- Midterm Exam. (2014.10.20, Mon.)
- Chap. 9 Electrical Properties of Polymers, Ceramics, Dielectrics and Amorphous Materials (Lect. #13)
- Chap. 10 The Optical Constants (Lect. #14 ~ Lect. # 15)
- Chap. 11 Atomistic Theory of the Optical Properties (Lect. #16 ~ Lect. #17)
- Chap. 12 Quantum Mechanical Treatment of the Optical Properties (Lect. #18)
- 30 min Quiz #2 (2014.11.12., Wed.)
- Chap. 14 Foundations of Magnetism (Lect #19)
- Chap. 15 Magnetic Phenomena and Their Interpretation-Classical Approach (Lect. #20 ~ Lect. #21)
- Chap. 16 Quantum Mechanical Considerations (Lect. #22 ~ Lect. #23)
- Chap. 19 Fundamentals of Thermal Properties (Lect #24)
- Chap. 20 Heat Capacity, Chap. 21 Thermal Conduction, Chap. 22 Thermal Expansion (Lect. # 25)
- Final Exam (2014.12.15., Mon)