

Electronic, Magnetic and Optical Properties of Materials

재료의 전자기적 성질 (445-312)

Fall 2021

Instructor: Byungwoo Park Mailstop 131-204 byungwoo@snu.ac.kr
<http://bp.snu.ac.kr> (ppt class notes)

Prerequisite: 재료현대물리, 양자역학

Time: Tue/Thu 12:30 p.m. - 1:45 p.m.

Classroom: Zoom and/or Mailstop 33-225

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Grading: 50 pts Midterm (Tue/Oct/19/2021)
50 pts Final Exam (Dec/ /2021)
In each exam, everybody is required to wear your own mask in the classroom. Otherwise, you are not allowed to have the exam.

All the announcements and updated lecture notes will be at <http://bp.snu.ac.kr>.
Due to the COVID-19 epidemic, schedules will be updated whenever necessary.

□ Course Objectives

Understanding the electrical, optical, magnetic, and thermal properties of materials through quantum mechanics.

재료의 전기, 광학, 자기, 열적 특성을 양자개념을 통해 이해한다.

□ Course Outline

Studying electromagnetic and matter waves using quantum mechanics, and electrical, optical, magnetic, and thermal properties of materials.

양자역학적 해석을 기반으로 전자기파, 물질파를 학습하고 물질의 전기, 광학, 자기, 열적 성질을 다룬다.

This is a mandatory class for juniors who need to understand the electrical, optical, magnetic, and thermal properties of materials that are required for information technology. In this regard, we study behaviors of atoms and electrons in solids by using quantum mechanics. The class would be helpful as a fundamental lecture for electronic materials, optical materials, and magnetic materials, which are applicable for semiconductor devices and thin-film devices.

본 과목은 재료공학부 학부 3학년을 위한 전공필수 과목으로서 정보처리, 정보전달, 정보저장 소자 등에 핵심적으로 사용되는 다양한 전자재료들이 가지고 있는 우수한 전기적, 광학적, 자기적 성질에 대한 근본적인 이해를 도모한다. 이를 위해 고체 내에서의 원자 및 전자의 거동에 대한 양자역학적인 해석을 다룬다. 박막소자 및 응용, 반도체 재료, 전기 재료, 광학 재료, 자성 재료 등 관련한 다양한 전공심화 및 응용 과목을 학습하는데 기초과목으로서 도움이 된다.

□ Main Text: Electrons in Solids, 3rd Ed., Richard H. Bube, Academic Press

References: Introduction to Solid State Physics, Charles Kittel, Wiley
Electronic Properties of Materials, Rolf E. Hummel, Springer
Modern Optics, R. D. Guenther, John Wiley & Sons
Elementary Solid State Physics, M. A. Omar, Addison-Wesley Pub. Co.
Introduction to Magnetic Materials, B. D. Cullity
Physics of Magnetism, S. Chikazumi

□ Grade Distribution

A (~30%), B (~30%), C (~30%), D and lower (~10%)

□ Topics

Chapter 1. Overview of Quantum Mechanics
Chapter 2A/2B/2C. Quantum Theory of Solids
Chapter 3A/3B/3C. Electrical Conduction in Solids
Chapter 4. Optical Properties
Chapter 5. Magnetic Properties