

MS 3022 材料物理性質 (吳志明)

課程概述與目標：

The understanding of the behavior of electrons in solids is one of the keys to understanding materials. The electron theory of solids is capable of explaining the optical, magnetic, thermal, as well as the electrical properties of materials. In other words, the electron theory provides important fundamentals for a technology which is often considered to be the basis for modern civilization. A few examples will illustrate this; optical properties of materials are utilized in lasers, optical communication, windows, lenses, optical coatings, solar collectors, and reflectors. Some materials are extremely good electrical conductors, such as silver and copper; others are good insulators, such as porcelain or quartz. Semiconductors are generally poor conductors at room temperature unless some dopants or impurity were doped into the materials. Thus, a considerable effort needs to be undertaken to comprehend its basic concepts. To cover these aspect viewpoints, the course units will be included as below.

教科書¹

TEXT book:
Electronic Properties of Materials – Springer, Edition: 4th ed. by Rolf E. Hummel
Reference books: Electrical Properties of Materials, L. Solymar and D. Walsh editors, seventh ed. Oxford Press,

內容綱要

Introduction

The Wave-Particle Duality

The Schrödinger Equation

Solution of the Schrödinger Equation for Four Specific Problems

Energy Bands in Crystals

Electrons in a Crystal

Electrical Conduction in Metals and Alloys

Semiconductors

Electrical Properties of Polymers, Ceramics, Dielectrics, and Amorphous Materials

The Optical Constants

Atomistic Theory of the Optical Properties

Magnetism and Phenomena

教學要點概述²：

1. 投影片教學配合手寫白板
2. 小考或作業佔 25%，兩次期中考、期末考各佔 25%。