ÇANKAYA UNIVERSITY
MSE 427 - Electronic, Optical and Magnetic Materials and Devices

2023-2024 Spring Semester

Methods of Instruction	Theor.	Appl.	Lab.	Total	Credit	ECTS Credit
	42	-	-	42	(3 0 3)	5
Semester	Spring Semester					
Instructor	Prof. Dr. Ziya Esen, Materials Science and Engineering Dept. Room: NB-16, e-mail: ziyaesen@cankaya.edu.tr					
Schedule	**Lecture Hours** Monday 13:20-16:10					

Course Description

This course will introduce the concept of electrons in solids. Specifically, it will describe how electrons interact with each other, electromagnetic radiation and the crystal lattice to give the material its inherent electrical, optical and magnetic properties. Semiconductors, metals, insulators, polymers and superconductors will be discussed. Device applications of physical phenomena are considered, including electrical conductivity and doping, transistors, photodetectors and photovoltaics, luminescence, light emitting diodes, lasers, optical phenomena, photonics, ferromagnetism.

Course Objective

1. To provide the comprehension of basic principles about the electrical, magnetic and optical properties of materials.
2. To present different types of materials which are used in applications for electronic, magnetic and optical purposes.
3. To enable the students to give presentation on a specific material which can be used in certain design applications.

Textbook

- Rolf E. Hummer, Electronic Properties of Materials, 4th edition, Springer-

Reference Books

- R.F. Pierret, Semiconductor Device Fundamentals, MA: Addison-Wesley

Grading Policy

Term project..... 35%

Midterms (I).....25%

Final..... 40%

Tentative Course Outline

Week	**Topics covered**
1	Introduction
2	Concept of Electron
3	Metals – Conductivity and Resistivity
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5	Insulators and Semiconductors
6	Temperature Effect, Carrier Concentration and Mobility
7	Semiconductor Devices
8	Midterm I
9	Superconductivity
10	Optical Materials and Properties
11	Optical Materials and Properties
12	Magnetic Materials and Properties
13	Magnetic Materials and Properties
14	Review