Course Title	Course Code	Number of Study Hours			Year	Level	Prerequisites
		Theoretical	Laboratory	Credit			
Solid State Physics 1	371PHYS	3		3	3rd	9th	311PHYS

(1)Brief Course Description

This course is intended to provide an introduction to the physics of solids including the properties of static (crystal structure), dynamic (lattice vibrations) arrangements of atoms and X-ray diffraction. Next we will study electron theory in metals and will identify key features distinguishing metals, insulators and semiconductors.

(2)Course Objectives:

This course is designed to provide students with:

- The fundamental of crystal structures and symmetry.
- The relationship between atomic bonding and various mechanical, thermal, and electronic properties.
- The concept of defects in solids.
- The essential elements of analysis of crystal structures using x-ray diffraction techniques.
- The theory of lattice vibrations (phonons).
- The principal of free electron theory.
- The classes of magnetic materials.

(3)Course Contents:

-Crystal Structure: Bravais lattice, primitive cell, lattice with a basis, common crystal structures (simple cubic, face centered cubic, body cantered cubic, diamond, and hexagonal), miller indices, and classification of Bravais lattice.

-The reciprocal lattice: definition of reciprocal lattice, construction of a reciprocal lattice, Brillouin zones, and lattice planes and reciprocal vectors.

-Crystal binding: crystals of inert gases, ionic crystals, covalent crystals, and metallic bonds.

- Defects in solids: amorphous solids; localized and extended defects.

- X-ray diffraction: Bragg's law, von Laue's formulation, experimental geometries suggested by the Laue condition, and structural factors.

- Phonons: lattice vibration, quantization of elastic waves, phonon momentum, heat capacity, thermal conductivity.

-Magnetic Properties of Materials: Basic Concepts in Magnetism, Diamagnetism, Paramagnetism,Ferromagnetism,Antiferromagnetism, Ferrimagnetism, Langevin Theory of Diamagnetism Quantum Mechanical Considerations: Paramagnetism, Diamagnetism, Ferromagnetism and Antiferromagnetism.

-The Drude theory of metals: basic assumptions of Drude model, DC electrical conductivity of a metal, Hall effect and magnetoresistance.

(4)Assessment Criteria

- Periodic Exams: 20%
- Student Activity(Homework, Quizzes, home activity) : 30%
- Final Exam:50%

(5)Course Teaching Strategies

- Lectures, Reports and Essay Assignments, Homework, and Web-based Assignments.

(6) Text Book

- C.Kittel. Introduction to Solid State Physics, 8th edn., Wiley, 2005.

(7) References

- Principles of the Solid State; H. V. Keer, Wiley Eastern Limited, London, 1993.
- The Solid State; H. M. Rosenberg, Oxford press, 1988.

Approved by:

Head of Physics Department

Dr. Hussain Alathlawi