

COURSE OUTLINE

PHYS 481– Fall 2021

Dr. Syeda Ammara Shabbir
Department of Physics, Forman Christian College,
A Chartered University, Lahore.

Email: ammaraanwar@fccollege.edu.pk

Phone: (42)99231581-8 Ext: 590

Cell# 03454073601

Office: S-038

Office hours: MWF 12-1 pm

COURSE OBJECTIVES

The purpose of this course is to familiarize the student with the methods, techniques, and main phenomenology of solid-state physics. This course introduces solid state physics, including the lattice structure, elastic properties and band structure theory etc. In this course, we will utilize various physics principles (learned in previous courses) to understand/explain the interesting phenomena in various solid-state materials, in preparation for future scientific research on solid states physics and material sciences.

LEARNING OUTCOMES

This course deals with crystalline solids and is intended to provide students with basic physical concepts and mathematical tools used to describe solids. The course deals with groups of materials, as in the periodic table, in terms of their structure, electronic, optical, and thermal properties. Upon completion of this course, the student will be able to:

1. To show how crystal symmetry leads to substantial mathematical simplifications when dealing with Solids.
2. To describe basic experimental measurements, to show typical data sets and to compare these with theory.
3. Apply physics principles to solve problems and explain experimental physics applications.
4. Develop the ability to appraise, use, and interpret experimental laboratory data collected to Correctly solve and/or explain the physical phenomena observed.

COURSE OUTLINES

Study of solids, crystal structure, direct and reciprocal lattices, types of bonding, lattice vibrations, the thermal, electrical and magnetic properties of solids and the effect of crystals.

Attendance and Grading Policy:

Student must attend all the lectures. The required attendance for this course is 75%. Any student falling below 75% attendance will not be allowed to sit in the final exam.

Course Materials:

1. Charles Kittel, Introduction to Solid State Physics, Wiley; 8th edition
2. Neil W. Ashcroft and N. David Mermin, Solid State Physics; 1st edition
3. M.Ali Omar, Elementary solid state physics, 5th edition.

Course grading: Your final grade will be based on the following:

Assignments + Quizzes + Paper Presentation	50%
Midterm Test	25%
Final Examination	25%
	100%

Online Methods and Resources:

- Each Video lecture will also be delivered online through bigbluebutton and its recording will be available on Moodle.
- All lecture slides and relevant material will also be shared through Moodle.
- All the assignments, quizzes and exams will be uploaded and conducted on Moodle.
- WhatsApp group for the course will help you to ask any query during the semester.
- Online advising will be available by appointments through email or WhatsApp.

Syllabus and Tentative schedule:

This page lists the assigned readings on selected topics [Week 1-14] from textbook of Elementary Solid-State Physics by M. Ali Omar.

Week	TOPICS	LECTURE SECTIONS	QUIZ/ASSIGNMENTS
1	Crystal Structure and crystal symmetry	Ch-1	
2	Fundamental Types of lattices	Ch-1	Assignment 1
3	Amorphous Solids and Liquids	Ch-1	Quiz 1
4	Crystal directions and crystal planes; Miller Indices	Ch-1	
5	Interatomic Forces and Type of bonding	Ch-1	
6	Diffraction from periodic structures	Ch-2	Assignment 2
7	The diffraction conditions and Bragg's Law	Ch-2	Quiz 2
8	Reciprocal lattice and X-Ray Diffraction	Ch-2	

9	Brillouin Zones	Ch-2	Assignment 3
10	Neutron and Electron Diffraction	Ch-2	Quiz3
11	lattice vibrations	Ch-3	
12	Vibrations of one-dimensional monoatomic Lattice	Ch-3	Assignment 4
13	Vibrations of one-dimensional diatomic Lattice	Ch-3	Quiz 4
14	Phonons, momentum of phonons	Ch-3	Paper Presentation