



# Course Specification

## (Bachelor)

Course Title: Solid State Physics 2

Course Code: PHYS 0483

Program: BSc in Physics

Department: Physics

College: Science

Institution: Majmaah University

Version: I

Last Revision Date: 30/12/2024



## Table of Contents

<b>A. General information about the course:</b> .....	3
<b>B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods</b> .....	4
<b>C. Course Content</b> .....	5
<b>D. Students Assessment Activities</b> .....	6
<b>E. Learning Resources and Facilities</b> .....	6
<b>F. Assessment of Course Quality</b> .....	7
<b>G. Specification Approval</b> .....	7



## A. General information about the course:

### 1. Course Identification

1. Credit hours: 3 (3, 0, 0)

#### 2. Course type

A.  University  College  Department  Track  Others  
B.  Required  Elective

#### 3. Level/year at which this course is offered:

#### 4. Course General Description:

This course builds on the foundational concepts of solid-state physics by focusing specifically on materials' electrical and magnetic properties. It explores how different materials conduct electricity, the behavior of electrons in solids, and the role of magnetic properties in solid-state systems. The course also introduces the theoretical and practical aspects of electrical conduction in metals, semiconductors, and insulators and the various magnetic phenomena that arise in solids.

#### 5. Pre-requirements for this course (if any):

Solid State Physics 1 PHYS 0381

#### 6. Co-requisites for this course (if any):

Nil

#### 7. Course Main Objective(s):

This course aims to provide students with a comprehensive understanding of electrical conduction in solids, focusing on the mechanisms behind it. Students will study the behavior of free electrons and the role of electron energy bands in materials while analyzing how temperature, impurities, and crystal structure influence electrical conductivity in metals, semiconductors, and insulators. The course will also cover the different types of magnetism, including paramagnetism, diamagnetism, ferromagnetism, antiferromagnetism, and ferrimagnetism. Students will gain an understanding of magnetic susceptibility and how materials respond to external magnetic fields. Additionally, the course will explore the effects of magnetic fields on the behavior of electrons in solids and examine how magnetic properties affect the macroscopic behavior of materials.

### 2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> <li>Traditional classroom</li> </ul>		





No	Mode of Instruction	Contact Hours	Percentage
	• E-learning		
4	Distance learning		

### 3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
<b>Total</b>		

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and understanding</b>			
1.2	Understand the various types of magnetism (paramagnetism, diamagnetism, ferromagnetism, etc.) and how these magnetic phenomena influence the macroscopic behavior of materials.	<b>K2</b>	Lectures	Exams, homework, classwork, and quizzes.
...				
<b>2.0</b>	<b>Skills</b>			
2.1	Analyze the electrical conductivity of different materials (metals, semiconductors, and insulators) by applying theoretical models and	<b>S1</b>	Problem solving. Homework	Exams, homework, classwork, and quizzes. Assignment





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
	experimental techniques.			
2.4	Examine and interpret magnetic properties of materials, including understanding the effects of external magnetic fields on electron behavior and material responses.	<b>S4</b>	<b>Problem solving. Homework</b>	<b>Exams, homework, classwork, and quizzes. Assignment</b>
...				
<b>3.0</b>	<b>Values, autonomy, and responsibility</b>			
3.2	Appreciate the importance of scientific accuracy in measuring and interpreting electrical and magnetic properties of materials, ensuring reliable and reproducible results.	<b>V2</b>	<b>Presentation, reports</b>	<b>Oral exams, Assignments</b>
3.2				
...				

### C. Course Content

No	List of Topics	Contact Hours
1	Overview of electrical conduction in solids.	3
2	Free Electron Theory	3
3	Band Theory of Solids	3
4	Electrical Properties of Metals	3
5	Introduction to semiconductor materials.	3
6	Temperature dependence and electrical properties of semiconductors.	3
7	Insulators and Band Gaps	3
8	Temperature Dependence of Electrical Conductivity	3
9	Magnetization and Magnetic Susceptibility	3
10	Diamagnetism and Paramagnetism	3
11	Ferromagnetism: Domain Theory and Curie-Weiss Law	3





12	Antiferromagnetism and Ferrimagnetism	3
13	Magnetic Hysteresis and Ferromagnetic Materials	3
14	Summary and Advanced Topics	3
15	Final Review and Exam Preparation	3
<b>Total</b>		<b>45</b>

## D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid exam*	week 6	15%
2.	e-learning quizzes	One/ Semester	10%
3.	Homework	Every Lecture	15%
4.	Discussions	Every week	10%
5.	Writing Report	One/ Semester	10%
6.	Final exam *	End of the semester	40%
7.	Final Exam	16 <sup>th</sup>	40 %

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

## E. Learning Resources and Facilities

### 1. References and Learning Resources

<b>Essential References</b>	Introduction to Solid-State Physics, Wiley, 8th Edition, 2004
<b>Supportive References</b>	Solid State Physics: An Introduction to the Theory, Springer, 2018
<b>Electronic Materials</b>	<b>Electronic Saudi Library</b>
<b>Other Learning Materials</b>	<a href="https://www.guru99.com/data-science-tutorial.html">https://www.guru99.com/data-science-tutorial.html</a>

### 2. Required Facilities and equipment

Items	Resources
<b>facilities</b> (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, data show, Smart Board, software
<b>Technology equipment</b> (projector, smart board, software)	Computer Lab. and Internet Lab.





Items	Resources
<b>Other equipment</b> (depending on the nature of the specialty)	Library, Wi-Fi internet connections

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Staff members (Peer Reviewer)	Direct (Student evaluation electronically organized by Deanship of registration and admission)/ Verification of students' papers
Effectiveness of Students assessment	Staff members (Peer Reviewer)	Indirect (Frequent meetings and consultation among the teaching staff)
Quality of learning resources	Staff members (Peer Reviewer)	Indirect (Frequent meetings and consultation among the teaching staff)
The extent to which CLOs have been achieved	Quality member	Direct (Meeting between course coordinators and the tutors)
Other		

**Assessors** (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

<b>COUNCIL /COMMITTEE</b>	Department council
<b>REFERENCE NO.</b>	16
<b>DATE</b>	30/12/2024

