هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	**Solid State Physics I**
Course Code:	371 PHYS
Program:	**Physics (undergraduate)**
Department:	**Physics**
College:	**College of Science**
Institution:	**Jazan University**
Version:	**2022-2**
Last Revision Date:	**2022-1**

Table of Contents:

A. General information about the course:

Course Identification					
1. Credit hours:	3				
2. Course type					
a.	University ☐	College ☐	Department☒	Track☐	Others☐
b.	Required ☒	Elective☐			
3. Level/year at which this course is offered: Level 9/Year 3					
4. Course general Description					
5. Pre-requirements for this course (if any): 341 PHYS					
6. Co- requirements for this course (if any): NIL					
7. Course Main Objective(s)					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	33	100%
2.	E-learning		
3.	Hybrid • Traditional classroom • E-learning		
4.	Distance learning		

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	3
5.	Others (specify)	

	Total	33

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

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	**Define** the concept of Crystal structure (crystal lattice, the base, principal vectors, unit cell, the crystal symmetrical properties, crystal planes, Miller indices**),** the various atomic bonds**,**	the lattice vibrations, phonons and defects in crystals and the magnetic properties of solids, the classical free electron theory in metals, Drude model and Debye Model	Lectures, blackboard and visualization, group and interactive guided discussion, Interactive discussion	We use definitions, example, equations that student can understand the topic of lectures, (book problems, from the reference books, and from other source) communicatio n and critical thinking competencies during interactive discussion, group assignments, essays or web-based activities, self-learning awareness
1.2	**Discuss** the reciprocal lattice, the crystal structure for a given solid based on X-ray diffraction, the contribution of phonons and electrons to the specific heat capacity of solids and the Magnetic properties of solids when placed		Lectures, blackboard and visualization, group and interactive guided discussion, Interactive discussion	

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	in an external magnetic field.			
1.3	**Describe** the concept of Crystal structure (crystal lattice, the base, principal vectors, unit cell, the crystal symmetrical properties, crystal planes, Miller indices**),** the various atomic bonds**,** the lattice vibrations, phonons and defects in crystals and the magnetic properties of solids.		Lectures, blackboard and visualization, group and interactive guided discussion, Interactive discussion	
2.0	Skills			
2.1	**Calculate** the theoretical density and the APF of solid crystal, the contributions of phonons to specific heat and thermal conductivity, the fundamental properties of metals using Drude model (electrical conductivity	Hall effect and the magnetic resistance), the net magnetization of an object and the magnetic permeability-susceptibility of permeability of a solid.	Lectures, blackboard and visualization, brain storming, group and interactive discussion, Interactive illustration – Problem based learning	We use problems that student can understand the topic of lectures, (book problems, from the reference books, and from other source), communicatio n and critical thinking competencies during interactive discussion, group assignments, essays or web-based activities, self-learning

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
				awareness
2.2	**Derive** the dispersion relation for the vibrational modes for monoatomic and diatomic crystal, the phonon contribution to the heat capacity at low and high temperatures,	the classical free electron theory in metals (Drude model), quantum theory to define the Fermi energy of a metal	Derive the dispersion relation for the vibrational modes for monoatomic and diatomic crystal, the phonon contribution to the heat capacity at low and high temperatures, the classical free electron theory in metals (Drude model),	
…				
3.0	Values, autonomy, and responsibility			
3.1	**Demonstrate** effective collaboration among group and bear individual responsibility during group work and /or assignments		Interactive and Group discussion, expository and discovery teaching	**Direct** (formative and summative): **Indirect**: student survey
3.2				
…				

C. Course Content

Theoretical Part

No	List of Topics	Contact Hours
1	**Crystal Structure:** Bravais lattice, primitive cell, lattice with a basis, common crystal structures (simple cubic, face centered cubic, body centered cubic, diamond, and hexagonal), miller indices, and classification of Bravais lattice. -	**5**
2	**The reciprocal lattice:** definition of reciprocal lattice, construction of a	**5**

	reciprocal lattice, Brillouin zones, and lattice planes and reciprocal vectors.	
3	**Crystal binding:** crystals of inert gasses, ionic crystals, covalent crystals, and metallic bonds.	**3**
4	**Defects in solids:** amorphous solids; localized and extended defects.	**3**
5	**X-ray diffraction:** Bragg's law, von Laue's formulation, experimental geometries suggested by the Laue condition, and structural factors.	**5**
6	**Phonons:** Lattice vibration, quantization of elastic waves, phonon momentum, heat capacity, thermal conductivity.	**3**
7	**Magnetic Properties of Materials:** Basic Concepts in Magnetism, Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferrimagnetism, Langevin Theory of Diamagnetism Quantum Mechanical Considerations:	**3**
8	**The Drude theory of metals:** basic assumptions of Drude model, DC electrical conductivity of a metal, Hall effect and magnetoresistance.	**6**
Total		**33**

D. Students Assessment Activities

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Homework assignment- Contribution in interactive discussion**	**2**	**3(3%)**
2	**Homework assignment- Contribution in interactive discussion**	**3**	**5 (5%)**
3	**Homework assignment- Contribution in interactive discussion**	5	**5(5%)**
4	**Quiz 1**	**7**	**5 (5%)**
5	**Mid-term exam**	**8**	**20 (20%)**

#	Assessment task*	Week Due	Percentage of Total Assessment Score
6	**Homework assignment- Contribution in interactive discussion**	**9**	**5(5%)**
7	**Homework assignment- Contribution in interactive discussion**	**10**	**5 (5%)**
9	**Quiz 2**	**11**	**5 (5%)**
	Final exam	12	**50 (50%)**

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

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	C. Kittel. Introduction to Solid State Physics, 8th edn., Wiley, 2005
Supportive References	✓ Principles of the Solid State; H. V. Keer, Wiley Eastern Limited, London, 1993. ✓ Elementary Solid State Physics: principles and Application (https://books.google.com.sa/books?id=WQRRAAAAMAAJ) ✓ The Solid State; H. M. Rosenberg, Oxford press, 1988
Electronic Materials	
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room(s) for groups of students.
Technology equipment (projector, smart board, software)	Data show- smart board. Blackboard, and projector
Other equipment (depending on the nature of the specialty)	Show the students some resource of elements like(salt, carbon, gold, silver, …..etc)

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Peer and program leader	Indirect (CES)- Indirect peer evaluation
Effectiveness of students assessment	Students, Peer and program leader	Direct/ Indirect
Quality of learning resources	Students, Faculty members	Indirect
The extent to which CLOs have been achieved		
Other		

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	DEPARTMENT BOARD

REFERENCE NO.	PHYS2304
DATE	28/2/2023

Approved by:

Head of Physics Department

Dr. Hussain Alathlawi