هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T-104
2022

Course Specification

Course Title:	Materials Science
Course Code:	PHYS 478
Program:	B.Sc. in Physics
Department:	Department of Physics and astronomy
College:	College of Science
Institution:	King Saud University
Version:	2.0.0
Last Revision Date:	Sep 2023

Table of Contents:

A. General information about the course:

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:	third level / second year.				
4. Course general Description The student provides students with information on crystalline and amorphous solids, type of defects in solids, different techniques of crystalline growth in solids and ceramics and their related alloys. X-ray diffraction and elemental analysis. This course also introduces the concept of diffusion and the associated Fick's laws. This course also discusses the concept of the phase diagram of materials and their related alloys under various conditions, such as temperature, pressure and concentration effect. The mechanical properties of materials, such as hardness and elasticity are also involved.					
5. Pre-requirements for this course (if any): Phy 371					
6. Co- requirements for this course (if any):					
7. Course Main Objective(s) 1. Recognizing the chemical bonds in solids and their relation with their properties. 2. Learning the crystalline and amorphous solids, X-ray diffraction and elemental analysis, different type of defects in solids, different techniques of crystalline growth in solids, ceramics and their alloys. 3. Defining and understanding the diffusion process and Fick's laws. 4. Understand the phase diagram of metals and alloys and their mechanical and optical properties within their different physical applications. 5. Understanding the mechanical proprieties of metals and alloys including stiffness, hardness, ductility, toughness, stress and strain.					

1. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1.	Traditional classroom	45	100%
2.	E-learning	0	0
3.	Hybrid • Traditional classroom • E-learning	0	0
4.	Distance learning	0	0

2. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	0
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
	Total	45

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	Differentiate the diffident types of chemical bonds	K1	• Give extensive examples during lecture. • Give problem sheets to be discussed during lecture..	• Hold Class discussion, tutorial sessions. • Give quizzes, mid-term exam and final exam.
1.2	Understand crystalline and amorphous solids and imperfection, X-ray diffraction and elemental analysis	K2		
1.3	Defining and understanding the diffusion process and Fick's laws	K3	• Give extensive examples during lecture. • Give problem sheets to be discussed during lecture..	• Hold Class discussion, tutorial sessions. • Give quizzes, mid-term exam and final exam.
1.4	Understand the phase diagram of metals and alloys and their mechanical and optical properties within their different physical applications	K4		

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.5	Understanding the mechanical proprieties of metals and alloys including stiffness, hardness, ductility, toughness, stress and strain			
2.0	Skills			
2.1	Acquire knowledge about the basic concepts of materials science starting from various states of materials and to learn about the useful techniques for crystalline growth and analysis in material science.	S1	• Give extensive examples during lecture • Give problem sheets to be discussed during lecture and labs. • assignments. • Discussions in the classes	• Hold Class discussion, tutorial and lab sessions. • Give quizzes, mid-term exam and final exam.
2.2	Develop skills to perform research bibliography and summarizing the existing research papers.	S2		
2.3	Acquire experience in writing reports and giving presentations.	S3		
3.0	Values, autonomy, and responsibility			
3.1	Gain experience by searching for research articles in recognized scholar webs.	V1	• provide small research project in the concerned course.	Hold Class discussion

C. Course Content

No	List of Topics	Contact Hours
1.	Chemical Bonds in Solids	3
2.	Crystalline and amorphous solids, Type of defects	3
3.	Crystal Structure of Metals	6
4.	Crystal growth, Thin films-Nanoproperties, Preparation of alloys and ceramics	6
5.	X-ray diffraction, Elemental analysis	3

6.	Imperfection in Solids	6
7.	Mechanical Proprieties of Metals and Alloys	6
8	Diffusion	6
9.	Phase change in solids and phase diagrams	9
Total		

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	First Midterm examination	Approx. 6	15%
2.	Second Midterm examination	Approx. 12	15%
3.	Homework	Weekly	15%
4.	Project	Approx. 14	15%
4.	Final examination	From 16 to 18	60%

*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	Materials Science and Engineering: An Introduction; by William D. Callister Jr. and David D. Rethwisch, Eighth Edition, 2010. ISBN: 978-0-4-7041997-7
Supportive References	Material Science and Engineering A first Course: Fifth Edition by V Raghavan PHI
Electronic Materials	None
Other Learning Materials	Internet sites relevant to the course

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	A classroom which accommodates 25 students.
Technology equipment (projector, smart board, software)	Whiteboard and Smart board
Other equipment (depending on the nature of the specialty)	Not applicable

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students\ Peer Reviewer	Indirect \ direct
Effectiveness of students assessment	Students- Faculty	Direct
Quality of learning resources	students	Indirect
The extent to which CLOs have been achieved	Faculty	Indirect
Other	None	None

Assessor (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval Data

COUNCIL /COMMITTEE	Physics Department's council
REFERENCE NO.	8th (1st term/1445)
DATE	06/06/1445