هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission
اعتماد
NCAAA
2024
TP-153

Course Specification

(Bachelor)

Course Title:	**Solid State Chemistry**
Course Code:	**CHM 1411**
Program:	**Bachelor of Science in Chemistry**
Department:	**Chemistry**
College:	**Science**
Institution:	**Imam Mohammed Ibn Saud Islamic University**
Version:	2024 V**1**
Last Revision Date:	13 October 2024

Table of Contents

A. General information about the course:

-1. Course Identification

1. Credit hours: 3 (3,0, 0)					
4(3 Lectures, 0 Turorial, 0 Lab)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐ Elective		
3. Level/year at which this course is offered: Level 7 / year 4					
4. Course general Description:					
This course covers the topics of Introduction to solid-state chemistry, periodicity of the elements, atomic structure, bonding, reactions kinetics and mechanisms, semiconductors, band gap, crystal structures, diffraction, amorphous solids, Chemical equilibrium, chemistry of carbon, and polymers.					
5. Pre-requirements for this course (if any)**:**					
Inorganic Chemistry (2) CHM 1311					
6. Co-requisites for this course (if any)**:**					
None					
7. Course Main Objective(s):					

By the completion of this course, students will be expected to:

- **Predict basic physical properties of materials based on knowledge of their atomic composition and chemical bonding.**
- **Readily describe the structure of crystalline materials using the nomenclature of Bravais lattices and Miller Indices.**
- **Use a binary phase diagram to quantitatively describe the compositions, phases and microstructures developed during heat treatments of binary solid systems.**
- **Use the principles of nucleation theory and solid state diffusion to solve problems involving kinetics of phase transformations in metal alloy systems.**
- **Use of computer teaching processes especially materials that require it.**
- **Create Website for course communication with student to provide them with homework assignments and teaching materials.**

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	**45**	**100%**
2	**E-learning**	**0**	**0**

No	Mode of Instruction	Contact Hours	Percentage
3	Hybrid • Traditional classroom • E-learning	0	0
4	Distance learning	0	0

0

3. 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 PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	To recognize the basic physical properties of materials based on knowledge of their atomic composition and chemical bonding.	K1; K3	• Three hours are weekly lectures . • A Private study including home exam.	• Quizzes Assignments • Discussions. • Participation.
1.2	To describe the structure of crystalline materials using the nomenclature of Bravais lattices and Miller Indices.	K1; K3;	• Three hours are weekly lectures . • Group discussion	▪ Quizzes ▪ Assignments. • Oral Discussion Laboratory Reports
1.3	To define the binary phase diagram, to outline the	K1;	• Three hours are weekly lectures .	▪ Quizzes ▪ Home exam ▪ Oral Discussions.

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	compositions, phases and microstructures developed during heat treatments of binary solid systems.		• Think, talk, and review the binary phase diagram and microstructures developed during heat treatments	
1.4	**To recall the principles of nucleation theory and solid state diffusion to solve problems involving kinetics of phase transformations in metal alloy systems**	**K1, K2**	• Three hours are weekly lectures . • A Private study including home exam dedicated to principles of nucleation theory and solid state diffusion	▪ Quizzes ▪ Assignments. ▪ Oral Discussion ▪ Written assay with giving marks
2.0	Skills			
2.1	**To predict the crystalline structures from Bravais lattices and Miller Indices data.**	**S1, S2**	Introduce some solved and unsolved examples of crystalline structures for prediction of its structures	• Questions in Lectures. • Short Quizzes and Exams. • Participation • Oral Discussion, • Home Exam.
2.2	**To develop cubic crystal systems and determines the planes and Miller indices.**	**S3**	• Group Discussions • Brainstorming Exercises	• Questions in Lectures. • Short Quizzes and Exams. • Oral Discussion
2.3	**To evaluate the optical and thermal properties of materials.**	**S1; S3**	▪ Oral Discussions. ▪ Brainstorming Exercises	▪ Questions in Lectures. ▪ Short Quizzes ▪ Exams.
2.4	**To differentiate between the various crystalline structure.**	**S2; S3; S4**	• Encourage the students to use the Chemicals, Glasswares and Instruments with caring and safety • Laboratory activities. •	• Assignments ▪ Short Quizzes ▪ Exams

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
3.0	Values, autonomy, and responsibility			
3.1	To appraise teamwork, and create awareness to maintain scientific integrity during different assessments.	V1;V2	• Group discussions • Homework • Mini reports	• Presentation marks • Oral tests • Assessments and homework • Group work reports and sheets

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to solid-state and materials science (Classifications of Materials and types of Solids).	10
2.	The atomic structure and the electron configurations and the wave- particle Duality	10
3.	Crystal Structures, the 14 Baravis Lattice, the closed packing systems, the crowding and coordination numbers of solid crystals, the crystal axes, planes and Miller indexes.	9
4.	X- ray Diffraction and Braggs' equation.	7
5.	Band theory of solids, band gaps and the electrical and thermal conductivity of metals, semiconductors and insulators, magnetic and optical properties of solids, crystal Imperfections, types of crystal defects..	9
	Total	45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Exam 1	Around 6th & 7th week	20 %
2.	Midterm Exam 2	Around 11th & 12th week	20%
3.	Quizzes, Home Works, class participation, and mini projects	During the semester	20 %
4.	Final Exam	Around 16- 17th week	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

Essential References	***Introduction to Solid-State Chemistry*** 2009, Pearson Custom Publishing (ISBN 10: 0-558-36407-1),
Supportive References	***Solid State Chemistry: An Introduction***, Lesley E. Smart, Elaine A. Moore, 4th Edition, 2012 by CRC Press, ISBN 9781439847909.
Electronic Materials	▪ **Blackboard** • **Class room** • **Internal server: \\10.10.70.70\ScienceShareFolder** • **http://highered.mcgrawhill.com/classware/ala.do?isbn=0073048518&alaid=ala_1136810&protected=true&showSelfStudyTree=true** **http://www.chem1.com/acad/webtext/virtualtextbook.html** **http://www.shodor.org/UNChem/index.html**
Other Learning Materials	· **None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Each classroom is equipped with PC and retro projector with a maximum of 25 students. • Each Laboratory should be equipped with maximum 25 seats
Technology equipment (projector, smart board, software)	The rooms are equipped with data show, Smart Board, WI-FI access.
Other equipment (depending on the nature of the specialty)	• None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Students**	**Direct:** Questionnaire.
	Course Responsible	**Direct:** Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Peer Reviewer	**Direct:** Questionnaire. **Indirect:** External assessor report.
Effectiveness of Students assessment	**Program Leaders**	**Direct:** Course e-Portfolio. **Indirect:** Course report.

Assessment Areas/Issues	Assessor	Assessment Methods
Quality of learning resources	**Students** **Faculty (Academic Advisory)** **Program Leaders**	**Indirect:** Second examiner checklist-Course report. **Direct:** course Entrance/Exit. **Indirect:** Observations - Accreditation review. **Direct:** Course e-Portfolio. **Indirect:** Course evaluation survey- Observations- Syllabus review- Accreditation review.
The extent to which CLOs have been achieved	**Course Responsible**	**Direct:** Exams - Course e-Portfolio. **Indirect:** Second examiner checklist-Course report.
	Program Leaders	**Indirect:** Exams.
Lab Performance	**Students** Course Responsible	**Direct:** Lab reports, Final Lab exam, Course e-Portfolio.

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	**COUNCIL OF DEPARTMENT OF CHEMISTRY**
REFERENCE NO.	**7 (NO. 2/3)**
DATE	**29/3/1446 - 2/10/2024**