هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Surface and Catalysis Chemistry
Course Code:	ICHM356-3
Program:	Bachelor of Science in Industrial Chemistry
Department:	Department of Physical Sciences
College:	College of Science
Institution:	Jazan University
Version:	TP-153 (2024)
Last Revision Date:	1 March 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3hrs.)

2. Course type

A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐ Elective		

3. Level/year at which this course is offered: (level 6 / year 3)

4. Course general Description:

Course title	Course code	Contact Hours			Credit Hours	Year	Level	Prerequisite	Corequisite
		Lec	Tut	Lab					
Surfaces and catalysis chemistry	ICHM 356-3	2	0	1	3	3rd	6th	CHEM 342-3	---

This course aims to studies the surface tension of liquids and the factors affecting it, measurement methods, adsorption processes on the free different surfaces, surfactants classification and applications, theories of adsorption, various isotherms and their calculations, catalysis and its types, and the mechanics of catalysis processes and their laboratory and industreial applications

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

CHEM 342-3

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

none

7. Course Main Objective(s):

1- Identify the science of surface chemistry, surfactants, and catalysis and its importance.
2- Understanding surface tension, the factors affecting it, and methods for measuring it.
3- Describe the different types of surfaces and adsorption types, their applications, measurement methods.
4- Identify the basic information about surfactants, types, conditions, and uses.
4- Identify positive and negative catalytic agents, the specialization of the catalytic agent.
5- Study of catalytic processes, types and their applications.
6- - Recognize the theories that explain the mechanics of catalysis.
7- Carry out laboratory works on some selected topics related to the course.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4 x15 = 60	100%
2	E-learning		
3	Hybrid • Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	$2 \times 15 = 30$
2.	**Laboratory/Studio**	$2 \times 15 = 30$
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		60

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;** *Upon completion of the course, students are able to:*			
1.1	***Demonstrate a thorough understanding and critical perspective on the key theories, concepts, and terminology of both theoretical applied surface chemistry and catalysis knowledge. (P)***	**K 1**	***Lectures, Class Discussion.***	***Objective questions***
1.2	***Describe and explain correctly chemical phenomena, practical procedures, tools, and techniques used by chemists using chemical***	**K 2**	***lecture/discussion / Problem-based Teaching***	***Essay questions.***

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	principles and scientific logic relater to surface chemistry and catalysis. (P)			
2.0	**Skills;** *Upon completion of the course, students are able to:*			
2.1	***Identify, design, and solve a variety of surface chemistry and catalysis problems. (P)***	**S1**	***lecture/discussion / Problem-based Teaching***	***Oral, solve problems H.W.***
2.2	***Carry out chemical experiments, analyze data and report results correctly. (P)***	**S2**	***Hands-on Practice, group work***	***Essay questions, lab report rubric.***
2.3	***Use a variety of instruments and lab tools to efficiently analyze different materials.***	**S3**	***Hands-on Practice, group work***	***lab report rubric.***
2.4	***Employ chemical safety skills in laboratory, industry and other work environment. (P)***	**S4**	***Hands-on Practice,***	***Safety exam***
2.5	***Communicate scientific information and research findings effectively in writing (laboratory notebooks, laboratory reports, research papers, etc.) or orally, using clear and concise scientific language. (P)***	**S5**	***web-based work Researches individual research projects, oral presentation***	***Research presentation***
3.0	**Values, autonomy, and responsibility;** *Upon completion of the course, students are able to:*			
3.1	***Work in groups and teams collaboratively with others. (P)***	**V1**	***group work, Oral presentation***	***Practical group Leader Rubric, Research presentation***
3.2	***Recognize the chemist's professional and ethical responsibilities. (P)***	**V2**	***Oral presentation, Interactive Discussions***	***Research presentation***

C. Course Content

1- Theoretical Part

No	List of Topics	Contact Hours
1.	*Introduction and basic concepts of surface chemistry, surfactants, and catalysis*	*2*
2.	*Factors affecting on surface tension, methods for measuring it and applications*	*3*
3.	*Adsorption from solutions - Adsorption on solid surfaces and its types -*	*4*
4.	*Theories that explain adsorption (Freundlich isotherm - Langmuir isotherm - BET theory), solve problem's*	*3*
5.	*What is a surfactant, types, micell formation, phase and phase digrame, solubilization, surfactant adsorption, preseptation,*	*4*
6.	*Emultions, fome, dispersion stability,*	*3*
7.	*Catalysis and catalysts types- Specialization of the catalyst- Poisoning Catalyst factor- negative and positive catalysis*	*3*
8.	*Homogeneous and heterogeneous catalysis - catalysis mechanism*	*4*
9.	*different theories to explain catalysis.*	*4*
Total		$2 \times 15 = 30$

2- Lab work

No	List of Topics	Contact Hours
1.	*Determine surface tension of liquids*	4
2.	*Adsorption of acetic acid on charcoal and prove the validity of Freundlich's adsorption isotherm.*	*2*
3.	*Adsorption of oxalic acid on charcoal and prove the validity of Langmuir's adsorption isotherm.*	*2*
4.	*Adsorption of colourd materials from aquous solution*	*4*
5.	*Adsorption of heavy metals from aquous solution*	*4*
6.	*Determine the critical miscelle concentration of soap*	*2*
7.	*Autocatalytic reaction,Catalytic salt effect.*	*4*
8.	*Study the Effect of concentration on adsorption*	*2*
9.	*Catalysts in accelerating and inhibiting some chemical reactions*	*4*
10	*Selected experiments related to the surfactants.*	*6*
Total		$2 \times 15 = 30$

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	*Periodic Exams*	*6-8*	*15%*
2.	*Assignments & Classroom activities*	*During semester*	*5%*
3.	*Lab work*	*During semester*	*30%*
4.	*Final Exam*	*16-17*	*50%*
		Total	*100%*

*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	1. *Peter William Atkins, Julio De Paula, James Keeler, Atkins' Physical Chemistry, (2023).* 2. *Surface Chemistry Essentials, K. S. Birdi. 2014 by Taylor & Francis Group* 3. *G. Rothenberg, Catalysis: Concepts and Green Applications, Wiley-VCH, Weinheim,2008.* 4. *Chemistry, John E. McMurry and Robert C. Fay, 2015, Pearson Education.* 5. *Surface Chemistry, Elaine M. Mccash, Oxford, (2002).* 6. Advanced physical chemistry experiements. J. N. Gurtu, Amuit Gurtu, 2008 Practical physical chemistry, By Findlay, 9th Edition 7. Carl W. Garland, Joseph W. Nibler, and David P. Shoemaker, 2008, "Experiments in Physical Chemistry" (McGraw-Hill). 8. Surface and Colloid Chemistry, Principles and Applications, K. S. Birdi, CRC Press, Taylor and Francis Group, 2010.
Supportive References	• *Chemical Kinetics and Reaction Dynamics,* 1st edition, *Paul L. Houston, 2006.* • *Chemical Kinetics and Reaction Dynamics, Santosh K. Upadhyay, Springer, 2006, ISBN 1-4020-4546-8 (HB) - ISBN 1-4020-4547-6 (e-book)* • *Principles of Chemical Kinetics ,* 2nd edition, *James E. House, 2007.*
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 50 students and a Lab. For 20 students.
Technology equipment (projector, smart board, software)	Smartboard, Data show, Blackboard, internet
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Student	Likert-type Survey CES) Indirect
Effectiveness of Students' assessment	Instructor & Course coordinator	Class room evaluation (direct & indirect
Quality of learning resources	Program coordinator	Indirect
The extent to which CLOs have been achieved	Assessment committee	Indirect
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physical Sciences Department Council
REFERENCE NO.	Meeting (3)
DATE	12/03/2024 -02/09/1445