



Course Specifications

Course Title:	Surface Chemistry and Catalysis
Course Code:	2044104-3
Program:	Bachelor in Chemistry
Department:	Department of Chemistry
College:	College of Sciences
Institution:	Taif University

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A. Course Identification

1. Credit hours: 3 (2 Theoretical, 1 Lab)
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 11 th Level/ 4 th Year
4. Pre-requisites for this course (if any): General Chemistry 2 (2042103-3)
5. Co-requisites for this course (if any): NA

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3 Theoretical and 2 Practical hours/ Week	100 %
2	Blended	-	-
3	E-learning	-	-
4	Distance learning	-	-
5	Other	-	-

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	20
3	Tutorial	-
4	Others (specify)	-
	Total	50

B. Course Objectives and Learning Outcomes

1. Course Description

This course is designed to help students to understand the different surface phenomena and its fundamental background. The course deals with chemical and physical phenomena that are important within heterogeneous catalysis.

2. Course Main Objective

Understanding surface chemistry phenomena and fundamentals of the chemistry occurring at surfaces and interfaces.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding:	
1.1	Recognize the surface tension and adsorption fundamentals and their applications	K1
1.2	Describe the role of catalyst in chemical processes	K2
1.3	Determine the interactions of catalysis chemistry and industrial applications	K3
2	Skills:	

CLOs		Aligned PLOs
2.1	Discuss the phenomena related to surface tension and its background	S1
2.2	Explain the theory of contact catalysis	S2
3	Values:	
3.1	Illustrate the concept of personal responsibility for achieving duties by teamwork.	V1

C. Course Content

No	List of Topics	Contact Hours
1	The importance of studying surface chemistry, The phenomenon of surface tension.	3
2	Theoretical background, Contact angle, Wettability.	3
3	The capillary, Measuring methods of surface tension of liquids - Effect of temperature on surface tension.	3
4	Interfacial tension, Spreading coefficient.	3
5	Adsorption and absorption: Theoretical background; Heat of Adsorption; Types of adsorption.	3
6	Adsorption applications; Adsorption Isotherms; Adsorption theory; Adsorption in solution.	3
7	Catalysis: Catalysts properties; Classification of catalytic process according to the phases of material	3
8	Mechanism of catalysis and its theories; Heterogeneous catalysis; Steps of heterogeneous catalysis.	3
9	Chemical theory and the theory of desorption for heterogeneous catalysis; Characteristics of catalytic processes.	3
10	Catalysis by enzymes: Mechanism of enzymatic catalysis; Factors affecting the enzymatic catalysis; Comparison between enzymatic and chemical catalysis.	3
Total		30

Lab Content

No	List of Topics	Contact Hours
1	Preliminary experiments showing surface tension phenomenon	2
2	Measure the surface tension of water by capillary	2
3	Measure the surface tension of hexane by capillary	2
4	Determine the effect of soap of on the surface tension of water by capillary	2
5	Determine the effect of temperature on of the surface tension of water by capillary	2
6	Measure the surface tension of water by drop-weight and drop-number methods.	2
7	Measure the surface tension of hexane by drop-number method	2
8	Adsorption of acetic acid from aqueous solution by charcoal	2
9	Determination the effect of adsorbent amount on the adsorption of acetic acid from aqueous solution	2
10	Effect of catalyst on the permanganate-oxalic acid redox reaction	2
Total		20

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	Knowledge and Understanding		
1.1	Recognize the surface tension and adsorption fundamentals and their applications	Lecture	Written Exam
1.2	Describe the role of catalyst in chemical reaction	Lecture	Written Exam
1.3	Determine the interactions of catalysis chemistry and industrial applications	E-learning	Written Exam
2.0	Skills		
2.1	Discuss the phenomena related to surface tension and its background	Discussion	Homework Assignments
2.2	Explain the theory of contact catalysis	Problem-Solving	Practical tasks and Exam
3.0	Values		
3.1	Illustrate the concept of personal responsibility for achieving duties by teamwork	Collaborative Learning	Individual presentations

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework Assignments	Throughout Semester	5%
2	Individual presentations	Throughout Semester	5%
3	Mid Term Exam	6	20%
4	Practical tasks	Throughout Semester	25%
5	Final practical Exam	10/11	5%
6	Final exam	11/12	40%

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Commitment to the rules of the Academic Advising Department at the university in accordance with the academic guidance manual approved by the university and the attached forms, there are different arrangements made by teaching staff to support student consultations including;

- Office hours: 8 hours per a week for each academic member.
- Academic guidance: an academic member has a number of students to guide them throughout degree journey.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<ul style="list-style-type: none"> Chemistry, John E. McMurry and Robert C. Fay, 2015, Pearson Education, Latest Edition. ISBN: 978-0-13-389179-9. https://tinyurl.com/5n88fncr
Essential References Materials	<ul style="list-style-type: none"> Essentials of Physical Chemistry, B. S. Bahl, G. D. Tuli and Arun Bahl, 2014. S. Chand Publication, Latest Edition. ISBN: 9788121929783. https://tinyurl.com/5d49mmhr
Electronic Materials	<ul style="list-style-type: none"> Saudi Digital Library (SDL) https://apps.tu.edu.sa/sdl/default.aspx
Other Learning Materials	<ul style="list-style-type: none"> Learning Management System (Blackboard)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> Lecture hall with 100 seats.
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> Data show, smart board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	-----

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and assessment	Students	Survey (indirect method)
Extent of achievement of course learning outcomes	Program leader	Reports (Direct method)
Quality of learning resources	Peer referees Students	Reports (Direct method) Survey (indirect method)

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Department Council/ Quality assurance committee
Reference No.	2-5-1444
Date	01/11/2022