



Course Specifications

| | |
|----------------------|----------------------------------|
| Course Title: | Surface Chemistry and Catalysis |
| Course Code: | CHEM343-3 |
| Program: | Bachelor of Science in Chemistry |
| Department: | Chemistry Department |
| College: | Faculty of Science |
| Institution: | JAZAN UNIVERSITY(JU)- |

| | |
|---------------------------------------------------------------------------------------------------|----------|
| A. Course Identification..... | 3 |
| 6. Mode of Instruction (mark all that apply) | 3 |
| B. Course Objectives and Learning Outcomes..... | 4 |
| 1. Course Description | 4 |
| 2. Course Main Objective..... | 4 |
| 3. Course Learning Outcomes | 4 |
| C. Course Content | 4 |
| D. Teaching and Assessment | 5 |
| 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods | 5 |
| 2. Assessment Tasks for Students | 5 |
| E. Student Academic Counseling and Support | 6 |
| F. Learning Resources and Facilities..... | 6 |
| 1. Learning Resources | 6 |
| 2. Facilities Required..... | 6 |
| G. Course Quality Evaluation | 6 |
| H. Specification Approval Data | 7 |

Table of Contents

A. Course Identification

| | | | | | |
|-------------------------------------------------------|----------------------------------------------|-----------------------------------|------------------------------------------------|---------------------------------|------------|
| 1. Credit hours: | 3hrs | Workload: | 169 | ECTS: | 6.0 |
| 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: | | | <i>5th level / Year 3</i> | | |
| 4. Pre-requisites for this course (if any): | | | | | |
| <i>none</i> | | | | | |
| 5. Co-requisites for this course (if any): | | | | | |
| <i>none</i> | | | | | |

6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|----|-----------------------|---------------|------------|
| 1 | Traditional classroom | 40 | 88.88% |
| 2 | Blended | | |
| 3 | E-learning | 5 | 11.12% |
| 4 | Distance learning | | |
| 5 | Other | 45 | 100% |

7. Contact Hours (based on academic semester)

| No | Activity | Contact Hours |
|----|-------------------|---------------|
| 1 | Lecture | 45 |
| 2 | Laboratory/Studio | --- |
| 3 | Tutorial | --- |
| 4 | Others (specify) | --- |
| | Total | 45 |

B. Course Objectives and Learning Outcomes

1. Course Description

| Course Title | Course Number | Contact Hours (CH) | | Credit unit (CU) | Year | Level | Pre-requisite |
|-------------------|---------------|--------------------|-------|------------------|-------|-------|---------------|
| | | Lec. | Prac. | | | | |
| Surface Chemistry | CHEM343-3 | 3 | 0 | 3 | Third | Fifth | none |

Course objectives: They are to identify the following.

- Identification of different catalytic process
- Identification of catalyst and its role and effect on the chemical reaction
- Identification of different catalytic theories.
- Identification of gas adsorption on solid surfaces.

Syllabus: A-Theoretical contents

Adsorption and its type, factors affecting on it, Gibbs and Langmuir theory for adsorption and its application on the surface area and calculations concerning with them.

Intermediate compounds and adsorption theories. Homogeneous and heterogeneous catalysis, (Enzymes), Colloids, its type, methods of preparation and its properties, theories for catalysis applications on the chemical process and heterogeneous catalyst.

Syllabus: B-Practical contents: none

*See attachment

2. Course Main Objective

The course is designed to give the students' knowledge about catalytic reactions, catalyst and its different applications, and colloids also studying surface chemistry and adsorption, especially on solid surfaces.

3. Course Learning Outcomes

| CLOs | | Aligned PLOs |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 1 | Knowledge and Understanding <i>Upon completing this course, student will be able to</i> | |
| 1.1 | <i>Demonstrate an understanding of the concepts of surface, catalyst, colloidal and its mechanisms and applications (P)</i> | K1 |
| 1.2 | <i>Describe the essential facts, principles and theories across the modeling isotherm, surface tension laws, theories of catalysis, preparation of colloids. (P)</i> | K2 |
| 2 | Skills : <i>Upon completing this course, student will be able to</i> | |
| 2.1 | <i>Demonstrate an ability in critical thinking, analytical reasoning and solving problems concerning with surface chemistry and adsorption (P)</i> | S1 |
| 2.2 | <i>use of communication, modern library searching and information technology about chemistry topics (I)</i> | S4 |

C. Course Content

| No | List of Topics | Contact Hours |
|----|----------------|---------------|
|----|----------------|---------------|

| | | |
|--------------|------------------------------------------------------------------------------------------------------------|-----------|
| 1 | <i>Meaning of surface / surface tension, parameters affect s on the surface</i> | 5 |
| 2 | <i>Criteria for surface phenomenon and spreading of liquid, contact angle, adhesion and cohesion force</i> | 8+1 Quiz |
| 3 | <i>Adsorption of gas on solid, isotherm (Freundlich, Langmuir and BET), applications</i> | 6 |
| 4 | <i>Gibbs equation, spreading of liquids</i> | 4+ 1 Exam |
| 5 | <i>Catalysis theories, applications</i> | 8+ 1 Quiz |
| ... | <i>colloids and its applications</i> | 5+ 1 Exam |
| | <i>Presentation Session</i> | 3 |
| | <i>General revision</i> | 2 |
| Total | | 45 |

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 | <i>Demonstrate an understanding of the concepts of surface, catalyst, colloidal and its mechanisms and applications (P)</i> | <i>Lecture Open discussion in class</i> | <i>Oral Fill-in the Blank Quizzes H.W.</i> |
| 1.2 | <i>Describe the essential facts, principles and theories across the modeling isotherm, surface tension laws, theories of catalysis, preparation of colloids. (P)</i> | <i>Lecture Group work discussion</i> | <i>Oral Written examination Labeling diagrams</i> |
| 2.0 | Skills | | |
| 2.1 | <i>Demonstrate an ability in critical thinking, analytical reasoning and solving problems concerning with surface chemistry and adsorption (P)</i> | <i>Lectures web-based work Researches</i> | <i>oral/written exam Quizzes H.W.</i> |
| 2.2 | <i>use of communication, modern library searching and information technology about chemistry topics (I)</i> | <i>individual research projects, oral presentation</i> | <i>Reports, and seminar presentation</i> |

2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|--------------------------------------|----------|--------------------------------------|
| 1 | <i>Homework assignment (H.W. 1)</i> | 2 | 2 |
| 2 | <i>Lecture Quizzes (Q1)</i> | 5 | 2 |
| 3 | <i>Mid-term exams (Mid 1)</i> | 8 | 15 |
| 4 | <i>Homework assignment (H.W. 2)</i> | 10 | 2 |
| 5 | <i>Quizzes (Q2)</i> | 12 | 2 |
| 6 | <i>Mid-term exams (Mid 2)</i> | 14 | 15 |
| 7 | <i>Seminar/ Presentation Session</i> | 14 | 2 |
| 8 | <i>Final Exam</i> | 17 | 60 |
| | <i>Total</i> | | 100 |

*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:

Students are grouped into groups of (5-10) students. Each group is assigned to a member of staff who will act as Academic Counselor. Members of staff be available for academic counseling on daily basis for at 4h/day during office hours.

F. Learning Resources and Facilities

1. Learning Resources

| | |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Required Textbooks | <p>1- <i>Physical Chemistry, James Keeler 11th .Ed.(2018) J.de Paula & P. Atkins.</i></p> <p>2- <i>R. I. Masel, "Principles of Adsorption and Reaction on Solid Surfaces", Wiley Series in Chemical Engineering, Wiley-Interscience, New York, USA, 1996, ISBN 978-0-471-30392-3</i></p> |
| Essential References Materials | <p>1- مبادئ الكيمياء الفيزيائية المطورة الطبعة الثانية، دار المعارف القاهرة ا.د. محسن الصباح ا.د. السيد علي حسن 1999</p> <p>2- <i>Handbook of Surface and Colloid Chemistry, Third Edition by K. S. Birdi 20, 2008.</i></p> <p>3- <i>Essentials of Physical Chemistry, Arun Bahl, 26th. Ed (2018) B.S. Bahal, G.D. Yuli.</i></p> |
| Electronic Materials | <i>Some course contents and materials are posted on Black board sites-</i> |
| Other Learning Materials | <ul style="list-style-type: none"> • www.wikipedia.org/ • https://chem.libretexts.org/Special:Search?qid=&fpid=230&fpth=&query=surface+chemistry&type=wiki • |

2. Facilities Required

| Item | Resources |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) | <i>Lecture room(s) for groups of 40 students.</i> |
| Technology Resources (AV, data show, Smart Board, software, etc.) | <i>Software programs (Virtual Chemistry Lab, Chem Lab)</i> |
| Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | <i>Chemical Models, scientific videos</i> |

G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|----------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------------|
| <i>Effectiveness of Teaching and Assessment</i> | <i>Student</i> | <i>Likert - type Survey (CES) <u>Indirect</u></i> |
| <i>Extent of achievement of course learning outcomes</i> | <i>Instructor & Course coordinator</i> | <i><u>Class room evaluation</u> <u>(direct & indirect)</u></i> |

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|--------------------------------------|-----------------------------|---------------------------|
| <i>Quality of learning resources</i> | <i>Program coordinator</i> | <i><u>Indirect</u></i> |
| <i>Exam Quality assessment</i> | <i>Assessment committee</i> | <i><u>Indirect</u></i> |

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 | Chemistry Department Council |
| Reference No. | 42 / 35 /102 112 |
| Date | 17 /09 /1442 Corresponding to 28 / 04 /2021 |