# Course Specification
## (Bachelor)

| | |
|---|---|
| **Course Title:** | **Surface, Colloids and Catalysis Chemistry** |
| **Course Code:** | **CEM 343** |
| **Program:** | **Bachelor of Science in chemistry - track of Chemistry** |
| **Department:** | **Chemistry** |
| **College:** | **College of Science** |
| **Institution:** | **Almajmaah University** |
| **Version:** | ☐ New ☒ Updated* |
| **Last Revision Date:** | **24/12/2024** |

## Table of Contents

## A. General information about the course:

### 1. Course Identification

| | | | | | |
|---|---|---|---|---|---|
| **1. Credit hours: (3 hours)** | | | | | |
| **2. Course type** | | | | | |
| **A.** | ☐University | ☐College | ☒ Department | ☐Track | ☐Others |
| **B.** | ☒ Required | | ☐Elective | | |
| **3. Level/year at which this course is offered: (3rd year/ 5thlevel)** | | | | | |
| **4. Course General Description:** | | | | | |
| The current course introduces four major topics: surface chemistry, catalysis, colloid chemistry, and phase equilibrium chemistry. In general, the course discusses the following topics: surface structure, adsorption behavior, physical properties of surfaces, homogeneous catalysis, heterogeneous catalysis, enzymatic catalysis, techniques of preparation and purification of colloids, applications of the use of colloids and finally, phase equilibrium in a single phase system such as water and sulphur. | | | | | |
| **5. Pre-requirements for this course** (if any)**:** | | | | | |
| **Bachelor of Science in chemistry - track of Chemistry-CEM240** | | | | | |
| **6. Co-requisites for this course** (if any)**:** | | | | | |
| **None** | | | | | |
| **7. Course Main Objective(s):** | | | | | |
| The current course introduces the basic knowledge and principles of four different -but connected- topics mainly, surface chemistry, catalytic chemistry, colloid chemistry, and phase equilibrium chemistry. Moreover, the course links the abstract theories and the physical meaning of various phenomena of daily life such as the phenomenon of liquid and gas adsorption, the phenomenon of wetness, the phenomenon of surface tension, catalysis in the field of petrochemicals, water phase conversion, detergents, and the manufacture of solids. Moreover, the course introduces the historical development of modern equations and the efforts made by scientists to realize them such as adsorption | | | | | |

equations, and the relationship between temperature and surface tension. The course contains several equations that train students to convert physical behaviors into mathematical expressions such as conversion calaulations, selectivity, and molecular size calculation.

## 2. Teaching mode (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | | |
| 2 | E-learning | - | - |
| 3 | Hybrid<br>• Traditional classroom<br>• E-learning | 30<br>15 | 66.67<br>33.33 |
| 4 | Distance learning | - | - |

## 3. Contact Hours (based on the academic semester)

| No | Activity | Contact Hours |
|---|---|---|
| 1. | **Lectures** | 29 |
| 2. | **Laboratory/Studio** | 29 |
| 3. | **Field** | |
| 4. | **Tutorial** | |
| 5. | **Others (specify)** | |
| **Total** | | 58 |

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Code of PLOs aligned with the program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| **1.0** | **Knowledge and understanding** | | | |
| 1.1 | Demonstrate knowledge and understanding of the basics and concepts | **K1** | -Lectures. | -Final exam<br>- Midterm exam |

| Code | Course Learning Outcomes | Code of PLOs aligned with the program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| | Surface Chemistry, Colloid and catalysts. | | - Conduct scientific research.<br>- Seminars.<br>-Discussions -Brainstorming | –Short tests<br>-Quizzes.<br>- Homework<br>- Class exercises<br>- Evaluation of research |
| 1.3 | Connect between the theoretical and practical lessons by conducting laboratory experiments | **K2** | | |
| ... | | | | |
| **2.0** | **Skills** | | | |
| 2.1 | Apply the knowledge and skill to solve problems relating to course concept | **S1** | -Lectures<br>-Laboratories<br>-Active learning<br>- E-learning<br>-Self-learning<br>-Cooperative Education<br>-Examinations | - Final exam<br>- Midterm exam<br>- Short tests<br>-Quizzes.<br>- Homework<br>- Class exercises<br>-Evaluation of research<br>-Practical tests |
| 2.2 | Use laboratory equipment and tools accurately | **S2** | | |
| **3.0** | **Values, autonomy, and responsibility** | | | |
| 3.1 | Work independently and as part of a team | **V1** | -Simulation programs<br>-Cooperative work<br>- Working in groups | -Practical tests<br>-Practical reports<br>- Note card<br>-Research papers |
| ... | | | | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1. | introduction to Surface tension and surface free energy (theory and measurement methods). Capillarity. Contact angle (theory and measurement methods), | 6 |

| | | |
|---|---|---|
| 2. | wetting, Surface forces, Surface films on liquid substrates (surface potential, monomolecular films). | 5 |
| 3. | The solid-gas interface (physical and chemical adsorption, adsorption isotherms. Monolayers and multilayers adsorptions). Detergency, surfactants, self-assembly, micelles and vesicles. | 5 |
| 4. | Introduction to Colloid state. Characterization Methods, Kinetic and Optical Properties of Colloids. Colloid stability. Emulsions, foams and aerosols. | 5 |
| 5. | Fundamental Equations in Colloid and Surface Science. | 5 |
| 6. | Applications of colloid and surface science in petroleum recovery, coating and painting, food, pharmaceutical and cosmetic industry. | 2 |
| 7. | **Practical** | 28 |
| 8. | | |
| **Total** | | **20** |

## D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|---|---|---|---|
| 1. | Homework | continuous | 10% |
| 2. | Midterm 1 | 6th | 15% |
| 3. | Midterm 2 | 12th | 15% |
| 4. | Practical examination | 13th | 20% |
| 5. | Final exam | 15th | 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 Applied Colloid and Surface Chemistry, GEORGIOS M. KONTOGEORGIS AND SØREN KIIL, John Wiley & Sons, 2016.<br>-Introduction to Surface Chemistry and Catalysis, Gabor A. Somorjai, Yimin Li, John Wiley & Sons, 2010<br>-Physical Chemistry 11$^{th}$ed. Peter Atkins and etc. Oxford University Press. 2018 |
| **Supportive References** | |
| **Electronic Materials** | - Saudi Digital Library |

| | |
|---|---|
| | - Science-direct<br>- Khan Academy on youtube |
| **Other Learning Materials** | - Tutorial CD, Bb, power point |

## 2. Required Facilities and equipment

| Items | Resources |
|---|---|
| **facilities**<br>(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Class rooms are available with smart boards and internet |
| **Technology equipment**<br>(projector, smart board, software) | Computers and internet are available for online study and video tutorials. |
| **Other equipment**<br>(depending on the nature of the specialty) | Labs are available with required glassware and chemicals |

## F. Assessment of Course Quality

| Assessment Areas/Issues | Assessor | Assessment Methods |
|---|---|---|
| Effectiveness of teaching | students | questionnaire |
| Effectiveness of Students assessment | students | Electronic questionnaire |
| Quality of learning resources | students | questionnaire |
| The extent to which CLOs have been achieved | Staff members | Internal revision reports |
| Other | | |

**Assessors** (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

| | |
|---|---|
| **COUNCIL /COMMITTEE** | Chemistry council |
| **REFERENCE NO.** | 16 |
| **DATE** | 8/12/2024 |