

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Surface and Catalysis Chemistry**

Course Code: **4026837-3**



Date: 29-10-2018

Institution: Umm Al-Qura University.

College: Faculty of Applied Science

Department: Department of Chemistry

A. Course Identification and General Information

1. Course title and code: **Advanced Surface and Catalysis Chemistry / 4026837-3**

2. Credit hours: **3 (theoretical)**

3. Program(s) in which the course is offered. **M. Sc. in Chemistry**

(If general elective available in many programs indicate this rather than list programs)

4. Name of faculty member responsible for the course. **Prof. Abd El Rahman Salah Khder**

5. Level/year at which this course is offered: **3rd / 2nd**

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

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

8. Location if not on main campus: **El-Abedyah, El-Azizya, and El-Zaher**

9. Mode of Instruction (mark all that apply):

| | | | |
|-------------------------------------|-------------------------------------|-------------|---------------------------------|
| a. Traditional classroom | <input type="checkbox"/> | percentage? | <input type="checkbox"/> |
| b. Blended (traditional and online) | <input checked="" type="checkbox"/> | percentage? | <input type="text" value="90"/> |
| c. E-learning | <input type="checkbox"/> | percentage? | <input type="checkbox"/> |
| d. Correspondence | <input type="checkbox"/> | percentage? | <input type="checkbox"/> |
| f. Other | <input checked="" type="checkbox"/> | percentage? | <input type="text" value="10"/> |

Comments:

B Objectives

1. The main objective of this course

The objectives of this course are to enable students to study in details the surface properties of Liquid- liquid, liquid-solid and gas –solid interfaces. Also the student will study homogeneous and heterogeneous catalysis and their applications in fine chemicals preparations and industrial applications.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- Updating the course content with the techniques that will be recently introduced in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the subjects using the library, data base services, and/or websites.

C. Course Description(Note: General description in the form used in the program's bulletin or handbook)

Course Description:

1. Topics to be Covered

| List of Topics | No. of Weeks | Contact hours |
|--|--------------|---------------|
| Surface tension, liquid interface | 1 | 3 |
| Surface properties of liquids, work of Adhesion and cohesion. Surface films on liquid substrates (spreading of one liquid on another). | 2 | 6 |
| Solid surfaces, the surface area, BET equation | 1 | 3 |
| Adsorption isotherms, Langmuir adsorption theory. Physical adsorption-surface area measurements | 2 | 6 |
| Fundamentals of catalysis and types of catalysis | 1 | 3 |
| Homogenous catalysis the principles and applications of homogeneous catalysis in fine chemicals | 2 | 6 |
| Heterogeneous catalysis, the principles and applications, conversion and selectivity, catalyst deactivation. | 2 | 6 |
| Catalyst manufacture | 2 | 6 |

2. Course components (total contact and credit hours per semester):

| | Lecture | Tutorial | Laboratory/ Studio | Practical | Other | Total |
|--|---------|----------|-----------------------|-----------|-------|-------|
| | | | | | | |

| | | | | | | | |
|---------------|---------|----|---|---|---|---|----|
| Contact Hours | Planned | 39 | - | - | - | - | 39 |
| | Actual | 39 | - | - | - | - | 39 |
| Credit | Planned | 3 | - | - | - | - | 3 |
| | Actual | 3 | - | - | - | - | 3 |

3. Individual study/learning hours expected for students per week.

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Curriculum Map

| Code # | NQF Learning Domains And Course Learning Outcomes | Course Teaching Strategies | Course Assessment Methods |
|------------|--|--|--|
| 1.0 | Knowledge | | |
| 1.1 | Determine the surface area of the solid from data of adsorption | <ul style="list-style-type: none"> Use of the internet to carry out some reports on course subjects. Lectures Discussion groups Seminar In class problems | <ul style="list-style-type: none"> Written assignments Presentations Formal mid-term and final exams. |
| 1.2 | Recognize the types of catalysis | | |
| 1.3 | Write the methods of catalyst preparation | | |
| 2.0 | Cognitive Skills | | |
| 2.1 | Apply the adsorption equations to practical data | <ul style="list-style-type: none"> Web-based study. Lectures. Scientific discussion Library visits. | <ul style="list-style-type: none"> Measuring the response to the assignments. Periodic tests and assignments. |
| 2.2 | Compare between homogeneous and heterogeneous catalysis. | | |
| 3.0 | Interpersonal Skills & Responsibility | | |
| 3.1 | Manage resources, time and collaborate with members of the group | <ul style="list-style-type: none"> Teamwork groups for cooperative work making. | <ul style="list-style-type: none"> Oral presentations Group discussion Reports |

| | | | |
|------------|--|---|---|
| 3.2 | Use university library and web search engines for collecting information and search about different topics | <ul style="list-style-type: none"> Solving problems in groups during lecture. Open discussion about recent topic of the course | |
| 4.0 | Communication, Information Technology, Numerical | | |
| 4.1 | Work effectively both in a team, and independently on solving chemistry problems. | <ul style="list-style-type: none"> Use digital libraries for literature survey Use E-Learning Systems for the communication with lecturer through the course work | <ul style="list-style-type: none"> Web-based student performance systems. Individual and group presentations. Evaluating the activities of the students through the semester . |
| 4.2 | Communicate effectively with his lecturer and colleagues | | |
| 4.3 | Use information and communication technologies | | |
| 5.0 | Psychomotor(if any) | | |
| 5.1 | Not applicable | | |

5. Assessment Task Schedule for Students During the Semester

| | Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.) | Week Due | Proportion of Total Assessment |
|---|---|----------|--------------------------------|
| 1 | Assignments and activities. | -- | 10 % |
| 2 | Midterm Exam. | 8 | 30 % |
| 3 | Final Exam. | 15-16 | 60 % |
| 4 | Total | | 100% |

D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)

- Availability of Staff members to provide counselling and advice.
- Office hours: During the working hours weekly.
- Academic advising for students.

E Learning Resources

1. List Required Textbooks

- Catalysis Concepts and Green Applications, Gadi Rothenberg , John Wiley & Sons, 2008.
- Industrial Catalysis: A Practical Approach, Second Edition. Jens Hagen WILEY VCH Verlag GmbH & Co. KGaA, Weinheim, 2006, ISBN: 3-527-31144-0.

2. List Essential References Materials (Journals, Reports, etc.)

- Lecture hand outs available on the coordinator website.

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

- <http://en.wikipedia.org/wiki/>
- <http://www.chemweb.com/>

| |
|--|
| <ul style="list-style-type: none"> • Websites on the internet relevant to the topics of the course |
| 4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. |
| * Non |

F. Facilities Required

| |
|---|
| Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.) |
| 1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) - Appropriate teaching class including white board and data show with at least 25 seats. |
| 2. Technology resources (AV, data show, Smart Board, software, etc.) - Computer halls access for the students will be helpful in doing their tasks during the course. |
| 3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) - Nother requirements. |

G Course Evaluation and Improvement Procedures

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|--|
| 1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching <ul style="list-style-type: none"> • Student discussion with the instructor allow for continuous feedback through the course progress. • Student Evaluation Questionnaires. |
| 2. Other Strategies for Evaluation of Teaching by the Instructor or the Department <ul style="list-style-type: none"> • Discussions within the group of faculty teaching the course. • Peer consultation on teaching strategies and its effectiveness. |
| 3. Procedures for Teaching Development <ul style="list-style-type: none"> • Workshops given by experts on new teaching and learning methodologies will be attended. • Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester |
| 4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) <ul style="list-style-type: none"> • Peer reviewing of random samples including periodic and final exams of the students will be done. |
| 5. Describe the planning arrangements for periodically reviewing course effectiveness and planning |

for developing it.

- The course will be evaluated periodically after each semester based on the results of the students and the report presented by the teaching staff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: Prof. Abdel Rahman Salah Khder

Signature:  Date Completed: 29 – 10 - 2018

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature:  Date Received: 30/10/2018

