



Course Specifications

| | |
|----------------------|---|
| Course Title: | Nanochemistry |
| Course Code: | 4024584-2 |
| Program: | Chemistry / Industrial Chemistry |
| Department: | Chemistry Department |
| College: | Applied Science |
| Institution: | Umm Al-Qura University |

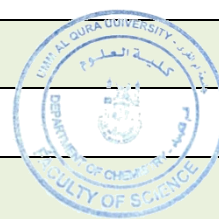


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A. Course Identification

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|--|
| 1. Credit hours: 2 (theoretical) |
| 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: 8 th /4 |
| 4. Pre-requisites for this course (if any): surface chemistry |
| 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 | √ | 100% |
| 2 | Blended | | |
| 3 | E-learning | | |
| 4 | Correspondence | | |
| 5 | Other | | |

7. Actual Learning Hours (based on academic semester)

| No | Activity | Learning Hours |
|------------------------------|---------------------------------|----------------|
| Contact Hours | | |
| 1 | Lecture | 28 |
| 2 | Laboratory/Studio | |
| 3 | Tutorial | |
| 4 | Others (specify) | |
| | Total | 28 |
| Other Learning Hours* | | |
| 1 | Study | 14 |
| 2 | Assignments | 4 |
| 3 | Library | 2 |
| 4 | Projects/Research Essays/Theses | 2 |
| 5 | Others (specify) | |
| | Total | 22 |

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course deals with the basic concepts of nano chemistry including general introduction and history of nanotechnology, classification of nanostructures, methods of preparation,

importance in industries. Taking some nanostructures as examples. Spectroscopic and microscopic tools used in nanomaterials characterizations

2. Course Main Objective

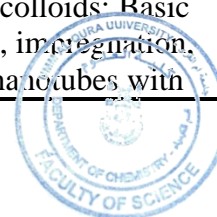
- Make the students acquainted to the basic concept of nano chemistry and changes of chemical and physical properties due size reduction, and the terminology related to science, nanomaterials and nanotechnology. The students will study the methods of nanoparticle preparation, the most recent tools of nanomaterials characterization, the applications and fictionalization of nanomaterials.

3. Course Learning Outcomes

| CLOs | | Aligned PLOs |
|----------|--|--------------|
| 1 | Knowledge: | |
| 1.1 | Recognize the basic concept of nano chemistry | K1 |
| 1.2 | Develop an awareness of methods of nanoparticles preparation | K5 |
| 1.3 | understanding of some applications of nanomaterials in industry | K5 |
| 1.4 | Gain knowledge of characterization tools of nanomaterials | K3 |
| 2 | Skills : | |
| 2.1 | Predict the type of hybridization in a chemical compound. | S1 |
| 2.2 | Compare between nanomaterial and other material | S1 |
| 2.3 | Estimate the principles of nanomaterials preparation and characterization | S4 |
| 2.4 | Basic interpersonal skills, relating to the ability to interact with other people and to engage in team working. | S8 |
| 2.5 | interpret the characterization results of nanomaterials | S4 |
| 2.6 | Skills in data presentation | S6 |
| 3 | Competence: | |
| 3.1 | Develop the student's ability in self-reliance and responsibility. | C2 |
| 3.2 | Communicate results and participate in discussions with his classmates. | C1 |
| 3.3 | Use computer and internet to preform reports on applications of nanomaterials | C3 |

C. Course Content

| No | List of Topics | Contact Hours |
|----|---|---------------|
| 1 | General introduction and history of nanotechnology. Importance of the nanoparticles in industries and in our lives. | 6 |
| 2 | Approaches in nanotechnology and typical syntheses of nanoparticles. Properties of nanomaterials, chemical and physical property. Reasons for changing the properties. | 4 |
| 3 | Classification of nanostructured and the chemical and physical properties of different nanostructured. Carbon Based Nanomaterials (Fullerenes, carbon-nanotubes and graphene) | 6 |
| 4 | exam | 2 |
| 5 | Nanomaterial based catalysts (inorganic nano materials, metal oxide supports, supported nano metal catalysts). Methods of preparation of nano-formulations and mesoporous materials | 4 |
| 6 | Nanoparticle synthesis and fixtures nanoparticles and nanocolloids: Basic synthesis and fabrication methods for nanomaterials (CVD, impregnation, sol-gel, microemulsion, template, hydrothermal) titanium nanotubes with | 4 |



| | | |
|--------------|--|-----------|
| | and without palladium, silver and gold nanoparticles and some other fixtures Spectroscopic and microscopic tools used in nanomaterials characterizations | |
| 7 | General industrial applications for nanoscale systems and fixtures, nano-optic applications, bio-nanotechnology applications and medical nanotechnology applications Nanotechnology and clean technologies: What is a clean technology challenges facing us in the areas of energy, water and environment, exploring the contribution of nanotechnology to solve these problems, the current obstacles faced by nanotechnology. | 4 |
| 8 | Final exam | 2 |
| Total | | 32 |



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 | | |
| 1.1 | Recognize the basic concept of nano chemistry | Scientific discussion and Lectures | Mid-tern and final written exams. |
| 1.2 | Develop an awareness of methods of nanoparticles preparation | Scientific discussion, library based study and Lectures | Mid-tern, oral and final written exams. |
| 1.3 | understanding of some applications of nanomaterials in industry | Scientific discussion and Lectures | Mid-tern, oral and final written exams. |
| 1.4 | Gain knowledge of characterization tools of nanomaterials | Scientific discussion, web based study and Lectures | Mid-tern and final written exams. |
| 2.0 | Skills | | |
| 2.1 | Predict the type of nanomaterials. | Lecture and web based study. | Periodic tests and assignments. |
| 2.2 | Compare between nanomaterial and other material | Scientific discussion and library based activities. | Mid term and Final exams. |
| 2.3 | Estimate the principles of nanomaterials preparation and characterization | Lecture and web based study. | Periodic tests and assignments, Mid term and Final exams. |
| 2.4 | Basic interpersonal skills, relating to the ability to interact with other people and to engage in team working. | Scientific discussion and library based activities. | Evaluate the results of collective works and duties |
| 2.5 | interpret the characterization results of nanomaterials | Lecture and web based study. | Periodic tests and assignments. Mid term and Final exams. |
| 2.6 | Skills in data presentation | Scientific discussion and library based activities. | Oral discussion |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------------|---|---|---|
| 3.0 | Competence | | |
| 3.1 | Develop the student's ability in self-reliance and responsibility. | class discussion | Oral discussion |
| 3.2 | Communicate results and participate in discussions with his classmates. | Work in groups in the class and in preparing some reports | Evaluate the results of collective works and duties |
| 3.3 | Use computer and internet to preform reports on applications of nanomaterials | class discussion | Oral discussion |

2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---------------------------|----------|--------------------------------------|
| 1 | Homework or activities. | -- | 10 % |
| 2 | First Periodic Exam. | 6 | 20 % |
| 3 | Second Periodic Exam. | 12 | 20 % |
| 4 | Final Exam.(2 hours exam) | 16 | 50 % |

*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 :

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

F. Learning Resources and Facilities

1.Learning Resources

| | |
|---------------------------------------|--|
| Required Textbooks | 1.Nanochemistry. G.B. Sergeev, K.J. Klabunde, Elsevier, 2013, ISBN: 978-0-444-59397-9 2.Introduction to Nanoscience and Nanotechnology, Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, John J. Moore, CRC Press. Copyright, 2009. 3.Nanomaterials and Nanochemistry, C. Bréchnignac, P. Houdy, M. Lahmani, Springer Science & Business Media. Copyright, 2006. 4.“Nanochemistry, A Chemical Approach to Nanomaterials”, G. Ozin and A. Arsenault, RSC (Royal Society of Chemistry), 2005. |
| Essential References Materials | 1.“Nanostructures and Nanomaterials”, G. Cao, Imperial College Press, 2004 2.Nanotechnology: Nanomaterials and Nanodevices, G. Mohan Kumar, Alpha Science International Ltd. 2015 |
| Electronic Materials | http://en.wikipedia.org/wiki/ http://www.chemhelper.com/ http://www.chemweb.com |

| | |
|---------------------------------|--|
| Other Learning Materials | |
|---------------------------------|--|

2. Facilities Required

| Item | Resources |
|--|--|
| Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.) | Well equipped lecture halls. |
| Technology Resources (AV, data show, Smart Board, software, etc.) | Room equipped with computer, data show and TV. |
| Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | No other requirements. |

G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|--|-----------------|--|
| Effectiveness of teaching and assessment. | Program Leaders | Periodic review of final exams and the student's degrees in this course. |
| Extent of achievement of course learning outcomes. | Peer Reviewer | Checking selected exam papers, and student assignments. |
| Quality of learning resources | Students | Complete the questionnaire evaluation of the course in particular |

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 | |
| Reference No. | |
| Date | |

Received by: **Dr. Ismail Althagafi**

Department Head

Signature:



Date: 20/12/2019

