



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

1. Credit hours:	2
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:	
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	√	79%
2	Blended		
3	E-learning	√	21%
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	22
2	Laboratory/Studio	
3	Tutorial	
4	Others (E-learning + Exams + office hours)	10
	Total	32

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 and Understanding	

CLOs		Aligned PLOs
1.1	Demonstrate broad knowledge and understanding of the underlying theories, principles, and concepts in nano chemistry.	K1
1.2	Identify characterization tools, chemical terminology, and different methods of preparations in nano chemistry	K2
1.3	Discuss the research development, importance and uses of nanomaterials and their applications in our life	K3
2	Skills :	
2.1	Predict the type of hybridization in a chemical compound.	S1
2.2	Compare between nanomaterial and other material.	S2
2.3	Estimate the principles of nanomaterials preparation and characterization.	S1
2.4	interpret the characterization results of nanomaterials.	S2
2.5	Communicate effectively using theoretical basis of nano chemistry to a variety of audiences	S4
2.6	Apply IT and communication technology in gathering and interpreting information and ideas concerning the nano chemistry.	S5
3	Values:	
3.1	Basic interpersonal skills, relating to the ability to interact and communicate with other people and to engage in team working.	V3

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		
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 and without palladium, silver and gold nanoparticles and some other fixtures Spectroscopic and microscopic tools used in nanomaterials characterizations	2+2E
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,	4E

	exploring the contribution of nanotechnology to solve these problems, the current obstacles faced by nanotechnology.	
8		
Total		22

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	Demonstrate broad knowledge and understanding of the underlying theories, principles, and concepts in nano chemistry.	Lectures	Mid-tern and final written exams.
1.2	Identify characterization tools, chemical terminology, and different methods of preparations in nano chemistry	Lecture E-Learning	Mid-tern, oral and final written exams. Assignments and activities on blackboard
1.3	Discuss the research development, importance and uses of nanomaterials and their applications in our life	Lecture E-Learning	Mid-tern, oral and final written exams. Assignments and activities on blackboard
2.0	Skills		
2.1	Predict the type of hybridization in a chemical compound.	Lecture	Periodic tests and assignments.
2.2	Compare between nanomaterial and other material.	Lecture	Mid term and Final exams.
2.3	Estimate the principles of nanomaterials preparation and characterization.	Lecture E-Learning	Mid-tern, oral and final written exams. Assignments and activities on blackboard
2.4	interpret the characterization results of nanomaterials.	Lecture E-Learning	Mid-tern, oral and final written exams. Assignments and activities on blackboard
2.5	Communicate effectively using theoretical basis of nano chemistry to a variety of audiences	Lecture	Mid-tern, oral and final written exams.
2.6	Apply IT and communication technology in gathering and interpreting information and ideas concerning the nano chemistry.	Lecture	Mid-tern, oral and final written exams.
3.0	Values		
3.1	Basic interpersonal skills, relating to the ability to interact and communicate with other people and to engage in team working.	E-Learning	Assignments and activities on blackboard

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments and activities	All weeks	10%
2	E-learning	All weeks	10%
3	Mid-term Exam	6	30%
4	Final Exam. (2 hours exam)	12	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. Bréchnac, 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/phys/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.

Item	Resources
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	

Head of Chemistry Department

Dr Moataz Morad

