Course Syllabus
Faculty of Arts and Science

Academic Department Chemistry

Academic Year 2022/2023 Semester: First

Course Title :	Nanotechnology techniques
Course No. :	1722426
Prerequisite :	
Concurrent :	-
Department :	Chemistry
Coordinator :	Dr. Dima Khater
Mode of Instruction	**On-Campus Learning** - 3 hours in-class (Synonym) learning

*** Instructor:**

Lecturer	Office Phone	Room No.	Office Hours	E-mail
Dr. Dima Khater	1283	224	11.00-12.00 S, M, T, W, Th	d_khater@asu.edu.jo

Course Description

This course is offered to students who are interested in solid chemistry and nanomaterials. It will introduce students to the synthesis, applications, characterization, properties, fabrication methods (top down & bottom up), functionalization and use of solid materials and nanomaterials such as nanoparticles and nano-porous materials.

Intended Learning Outcomes

Upon the completion of the course, this module should lead to the following learning outcomes:

A. Knowledge and Understanding (Student should):

A1 Define the nano-scale materials and list their principal characteristics

A2 State different methods for Synthesis and/or stabilization of nano-scale materials.

A3 Outline the properties and/or applications of nanoparticles.

B. Cognitive and Intellectual Skills (Student should):

B1 Explain the forces which are responsible for self-assembly

B2 Write main points of difference between nanomaterials and bulk materials

B3 Compare the principles of the characterization techniques and justify the use of each one.

C. Subject Specific Skills (Student should):

C1 collaborate effectively with other people in a team

C2 communicate the results of scientific work

Program Learning Outcomes (PLOs):

1.1	Describe the fundamentals of chemistry including structure, reactivity, and properties of chemical substances, the different situations of reaction, and the states of matter.
1.2	Construct essential facts, principles, and theories across the four principal areas of chemistry, i.e. analytical, organic, inorganic, and physical.
2.1	Differentiate between the different states of the matter, elements, and compounds based on the recognition and quantification of the properties.
2.2	Explain concepts, and principles, and determine the efficiency of chemical systems by applying mathematical expressions.
2.3	Analyze chemical and spectral data to identify and confirm chemical structures as well as determine the chemical composition
2.4	Establish and conclude mechanisms for physical and chemical processes
2.5	Solve the scientific problems using different mechanisms and procedures
2.6	Present scientific material and arguments clearly and correctly, in writing and orally, to a range of audiences
3.1	Demonstrate adequate life-long learning skills.
3.2	Collaborate effectively with other people in a team.
3.3	Select appropriate techniques and procedures for chemical synthesis and analysis.
4.1	Demonstrate information technology skills, especially in the areas of information retrieval, literature searching, and use of library databases
4.2	Communicate effectively both orally and in writing with professionals and/or lay audience
4.3	Interpret data derived from laboratory observations and measurements in terms of their significance and the theory underlying them.
4.4	Employ computational software and data-processing skills in handling chemical information and analysis of chemical data
5.1	Assemble and use properly chemistry experimental setups
5.2	Perform correctly quantitative measurements requiring accurate and precise manipulations

PLO	A1	A2	A3	B1	B2	B3	C1	C2
1.1	√							
1.2	√							
2.1		√						
2.2	√					√		
2.3			√			√		
2.4		√						
2.5				√				
2.6								√
3.1				√				
3.2							√	
3.3		√						
4.1					√			
4.2							√	
4.3				√				
4.4								
5.1								
5.2							√	

Course Contents and Schedule

Week	Day and Date	Topics to be covered	Method of instruction	CLOs	PLOs
1	Sun	**Introduction to colloids**	In-class lecture	**A1**	**1.1 1.2 2.2**
	Tue.		In-class lecture		
	Thur.		In-class lecture		
2	Sun.	**Introduction to colloids**	In-class lecture	**A1**	**1.1 1.2 2.2**
	Tue.		In-class lecture		
	Thur.		In-class lecture		

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3	Sun. Tue. Thur..	**Introduction to Nanochemistry**	In-class lecture In-class lecture In-class lecture	**A1**	**1.1 1.2 2.2**
4	Sun. Tue. Thur.	**Size effect in Nanochemistry.**	In-class lecture In-class lecture In-class lecture	**A3 B1**	**2.3 2.5 3.1 4.3**
5	Sun. Tue. Thur.	**Size effect in Nanochemistry.**	In-class lecture In-class lecture In-class lecture	**A3 B1**	**2.3 2.5 3.1 4.3**
6	Sun. Tue. Thur.	**Synthesis and stabilization of nanoparticles**	In-class lecture In-class lecture In-class lecture	**A2**	**2.1 2.4 3.3**
7	Sun. Tue. Thur	**Synthesis and stabilization of nanoparticles**	In-class lecture In-class lecture In-class lecture	**A2**	**2.1 2.4 3.3**
8.	Sun. Tue. Thur.	**Synthesis and stabilization of nanoparticles**	In-class lecture In-class lecture In-class lecture	**A2**	**2.1 2.4 3.3**
9	Sun1rd May Tue. Thur.	**Self-Assembly of Nanostructures**	 In-class lecture In-class lecture	**B1**	**2.5 3.1 4.3**
10	Sun Tue. Thur.	**Carbon based Nanostructures**	In-class lecture In-class lecture In-class lecture	**A2 A3 B2**	**2.1 2.3 2.4 3.3 4.2**
11	Sun Tue Thur	**lipid based Nanostructures**	In-class lecture In-class lecture In-class lecture	**A2 A3 B2**	**2.1 2.3 2.4 3.3 4.2**
12	Sun Tue Thu	**Inverse Systems: Nanoporous Solids**	In-class lecture In-class lecture In-class lecture	**A2 A3 B2**	**2.1 2.3 2.4 3.3 4.2**
13	Sun Tue. Thu.	**Inverse Systems: Nanoporous Solids** s	In-class lecture In-class lecture In-class lecture	**A2 A3 B2**	**2.1 2.3 2.4 3.3 4.2**

14	Sun.	**Characterization techniques of nanoparticles**	In-class lecture	**B3 C2 C1**	**2.2 2.3 3.2 4.2 4.2 2.6**
	Tue.		In-class lecture		
	Thur.		In-class lecture		
15	Sun.	**Characterization techniques of nanoparticles**	In-class lecture	**B3 C2 C1**	**2.2 2.3 3.2 4.2 4.2 2.6**
	Tue		In-class lecture		
	Thu		In-class lecture		
16.	**Final Exam**				

Grading Plan and Assessment Tools

Assessment Tools	Weights	Due date
Mid-term	30	TBA
Assignments	5	TBA
Quizzes	10	TBA
Interactive lectures	……	
Group Work	……	
Presentation	5	TBA
Reports	……	
Project	……	
Case-Study	……	
Final Exam	50	TBA

Supplementary Reading

Textbook:

- **G.B. Sergeev, K.J. Klabunde, Nanochemistry, Elsevier, 2013, ISBN: 978-0-444-59397-9**
- **G. A. Ozin, A. C. Arsenault, and L. Cademartiri, Nanochemistry, RSC, 2009, ISBN: 978-84755-895-4**

References:

- **International** *Journal of Nanomaterials* **and Chemistry (IJNC)**
- *Journal of Nanomaterials* **(JNM)**
- **Nanochemistry - American Chemical Society**

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Subject Coordinator	**Dr. Dima Khater**	**Signature:** ----------
Head of Curriculum Committee	**Dr. Hussam Miqdad**	**Signature:** ----------
Department Head	**Dr. Hussam Miqdad**	**Signature:** ----------
Faculty Dean	**Dr. Hadeel Ali Saed**	**Signature:** ----------

Copy to:
- Department Head.
- Head of Curriculum Committee.
- Course File.