Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	06

1.	Course Title	Nanochemistry
2.	Course Number	0333943
3.	Credit Hours (Theory, Practical)	3(3+0) Hybrid
	Contact Hours (Theory, Practical)	38-42 hours per semester
4.	Prerequisites/ Corequisites	none
5.	Program Title	Chemistry
6.	Program Code	03
7.	School/ Center	Science
8.	Department	Chemistry
9.	Course Level	Ph.D.
10.	Year of Study and Semester (s)	2024-2025
11.	Other Department(s) Involved in Teaching the Course	none
12.	Main Learning Language	English
13.	Learning Types	☐Face to face learning ■ Blended ☐Fully online
14.	Online Platforms(s)	☐Moodle ■Microsoft Teams
15.	Issuing Date	11/11/2024
16.	Revision Date	11/11/2024

17. Course Coordinator:

Name: Imad Hamadneh Contact hours: 4-5 Mon, Wed

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18. Other Instructors:

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
Office number:
Phone number:
Email:
Contact hours:

19. Course Description:

This course covers structure, electronic distribution and defects in crystals and their effects on conductivity, solid state reactions and catalysis, synthesis and properties of nanomaterials

20. Program Student Outcomes (SO's): (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

SO1. Develop chemistry expertise, focus on theory and practice, and contribute to advancing knowledge in a specific research field.

SO2. Conduct original, high-quality research that advances knowledge in chemistry by developing complex projects using innovative methodologies.

SO3. Mentor junior researchers and students and demonstrate leadership in the scientific community through collaboration, peer review, and knowledge exchange.

SO4. Recognize the ethical implications and responsibly use chemistry solutions to tackle global challenges.

SO5. Participate in ongoing professional development to stay up to date with the latest research and innovations.

21. Course Intended Learning Outcomes (CLO's): (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. To correlate the principles of chemistry in Materials Science and Nano Chemistry

2. Problem solving: to be able to apply mathematical and scientific knowledge to calculate the crystalline volume, dimensions, densities, and directions. The calculations related to materials synthesis, using proper software for the calculations (ASO-1 -5)

3. Design: the postgraduates will be able to use their understanding of materials synthesis and chemistry concepts to formulate and design nanoceramics with different techniques to meet the application's desires. (ASO-1,2,3 and ASO-5)

4.

Course CLOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
CLO-1	✓			✓		
CLO-2	✓	✓	✓	✓	✓	
CLO-3	✓	✓	✓		✓	

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program SO's / Course CLO's	SO (1)	SO (2)	SO (3)	SO (4)	SO (5)	SO (6)	SO (7)
CLO (1)	✓			✓			
CLO (2)	✓	✓	✓	✓	✓		
CLO (3)	✓	✓	✓		✓		
CLO (4)							
CLO (5)							
CLO (6)							
CLO (7)							
CLO (8)							

23. Topic Outline and Schedule:

Week	Lecture	Topic	CLO/s Linked to the Topic	Learning Types Face to Face (FF) Blended (BL) Fully Online (FO)	Platform Used	Synchronous (S) Asynchronous (A)	Evaluation Methods	Learning Resources
1	1.1	Structure of materials	1&2	BL	Teams			
	1.2	Nano materials	1&2	BL	Teams			
	1.3	Nano synthesis and nanotechnologyy	1&2	BL	Teams			
2	2.1	nanomaterials at Subatomic level, Atomic level,	1&2	BL	Teams		Assig nment	
	2.2	Microscopic level, Macroscopic level	1&2	BL	Teams			
	2.3	Chemical composition	1,2 &3	BL	Teams			
3	3.1	Packing Factor	1,2 &3	BL	Teams			
	3.2	14 Bravais Lattices	1,2 &3	BL	Teams			
	3.3	Unite cell, theoretical density	1&2	BL	Teams			
4	4.1	Directions, linear density	1&2	BL	Teams			
	4.2	Scherrer Equation and its application	1&2	BL	Teams		Assig nment	
	4.3	Clusters of atoms and molecules Directions	1,2 &3	BL	Teams		Mid Exam	
5	5.1	Surface chemistry	1,2 &3	BL	Teams			
	5.2	Adsorption and absorption	1,2 &3	BL	Teams			
	5.3	Surface area, pore size	1,2 &3	BL	Teams			
6	6.1	Dispersion and colloidal system	1,2 &3	BL	Teams		Assig nment	

	6.2	Zeta potential	1,2 &3	**BL**	Teams			
	6.3	Surface plasmon interaction	1,2 &3	**BL**	Teams			
7	7.1	Solid State Synthesis	1&2	**BL**	Teams		Assig nment	
	7.2	**Fick's First Law** (Steady-State Diffusion)	1,2 &3	**BL**	Teams			
	7.3	**Fick's First Law** (Practical exercises)	1,2 &3	**BL**	Teams			
8	8.1	**Fick's Second Law** (Time-Dependent Diffusion)	1,2 &3	**BL**	Teams			
	8.2	**Fick's Second Law** (Practical exercises)	1,2 &3	**BL**	Teams			
	8.3	Synthesis of nanomaterials	1,2 &3	**BL**	Teams			
9	9.1	Coprecipitation method	1,2 &3	**BL**	Teams			
	9.2	Sol-Gel, self-ignition methods	1,2 &3	**BL**	Teams			
	9.3	Amorphous and Thin film	1,2 &3	**BL**	Teams			
10	10. 1	Condensed material and aerogel	1,2 &3	**BL**	Teams			
	10. 2	Single Cystal and polycrystalline synthesis	1,2 &3	**BL**	Teams			
	10. 3	Factors that affect the Reaction Rates	1,2 &3	**BL**	Teams		Prese ntatio ns	
11	11. 1	Characterization of nanomaterials	1,2 &3	**BL**	Teams			
	11. 2	XRD	2 &3	**BL**	Teams			
	11. 3	XRD software	2 &3	**BL**	Teams		Assig nment	
12	12. 1	Calculations related to XRD	2 &3	**BL**	Teams			

	12.2	SEM/TEM	1&2	**BL**	Teams			
	12.3	EDS, WDS	1&2	**BL**	Teams			
13	13.1	XRF	1&2	**BL**	Teams		Assignment	
	13.2	UV-VIS,	1&2	**BL**	Teams			
	13.3	FTIR, RAMAN	1&2	**BL**	Teams			
14	14.1	Industrial applications	1&2	**BL**	Teams			
	14.2	Agricultural applications	1&2	**BL**	Teams			
	14.3	Biomedical applications	1&2	**BL**	Teams		Assignment	
15	15.1	Water and environmental applications	1&2	**BL**	Teams		Presentations	
	15.2	Construction ceramics	1&2	**BL**	Teams		Presentations	
	15.3	Electro ceramics	1&2	**BL**	Teams		Presentations	
16							Final Exam	

24. Evaluation Methods:

Opportunities to demonstrate achievement of the CLOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	CLO/s Linked to the Evaluation activity	Period (Week)	Platform
Midterm Exam	25		1,2 &3		
Assignments	10		1,2 &3		
Final Presentation	15		1,2 &3		

Final Exam	40		1,2 &3		

25. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):

26. Course Policies:

A- Attendance policies:
B- Absences from exams and submitting assignments on time:
C- Health and safety procedures:
D- Honesty policy regarding cheating, plagiarism, misbehavior:
E- Grading policy:
F- Available university services that support achievement in the course:

27. References:

A- Required book(s), assigned reading and audio-visuals:
1- Solid State Chemistry, CRC, (4th ED) Lesley E. Smart., Elaine A. Moore,
B- Recommended books, materials, and media:
1- Fundamentals of Materials Science and Engineering (10thEd) William D. Callister, Jr. 2- The Science and Engineering of Materials (6th Ed), Donald Askeland

28. Additional information:

Name of the Instructor or the Course Coordinator: **Prof. Imad Hamadneh**	Signature: ……..……	Date: ……..……
Name of the Head of Quality Assurance Committee/ Department -	Signature: ……..……	Date: ……..……
Name of the Head of Department **Prof. Murad AlDamen**	Signature: ……..……	Date: ……..……
Name of the Head of Quality Assurance Committee/ School of Science **Prof. Emad A. Abuosba**	Signature: ……..……	Date: ……..……
Name of the Dean or the Director **Prof. Mahmoud I. Jaghoub**	Signature: ……..……	Date: ……..……