Jordan University of Science and Technology

Faculty of Institute Of Nanotechnology

Nanotechnology And Engineering Department

NANO708 Chemistry Of Nanomaterials - JNQF Level: 9

Second Semester 2025-2026

Course Catalog
3 Credit Hours. 3 Credit hours (3 h lectures). This course aims to provide a comprehensive overview of the chemical and physical properties and reactions of Nanomaterials and how they are different from bulk materials. Topics covered include the chemical composition of Nanomaterials, Nanocrystal, Clusters, Dendrimers, Nanodispersion, Nanoporous materials, Composites and Nanocomposites, types, properties, reactivity, preparation, and characterization. Emphasis is placed on understanding the design and properties of nanomaterials that are utilized in advanced applications, including catalysts (nanoparticles, Nanodispersion), carriers of drug delivery (Nanoparticles, Dendrimers), modified membranes (clay/polymer), lightweight high-strength materials (CNT/Polymer nanocomposite), biosensors (Dendrimers).
Teaching Method: On Campus

Text Book	
Title	Nanomaterials and Nanochemistry
Author(s)	C. Br?echignac P. Houdy M. Lahmani (Eds.)
Edition	1st Edition
Short Name	1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
2	Nanoclusters, Volume 1 A Bridge across Disciplines	Purusottam Jena, A. Welford Castleman Jr. Jr. (Eds.)	1st Edition	
3	The Delivery of Nanoparticles	Edited by Dr. Abbass A. Hashim	1st Edition	
4	Nanomaterials Chemistry Recent Development and New Direction	Edited by C. N. R. Rao, A. M?ller, A. K. Cheetham	1st Edition	

5	The Chemistry of Nanomaterials, Synthesis, Properties and Application	C. N. R. Rao, A. Muller, A. K. Cheetham	1st Edition	
6	Essentials in Nanoscience and nanotechnology	Kumar, Narendra & Kumbhat, Sunita	1st Edition	
7	Handouts	Dr. Ayat Bozeya	1st Edition	

Instructor	
Name	**Dr. Ayat Bouzieh**
Office Location	Institute of Nanotechnology
Office Hours	Sun : 09:00 - 11:00 Mon : 11:00 - 12:00 Tue : 09:00 - 11:00 Wed : 15:00 - 16:00
Email	aabouzieh@just.edu.jo

Class Schedule & Room
Section 1: Lecture Time: Wed : 11:00 - 14:00 Room: NANO 2

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	Introduction to nanomaterials in Chemistry	**Ch. # 1** From **1**, **Ch. # 1** From **5**, **L1** From **7**
Week 2	Nanocrystal/ Reactivity of Colloidal Inorganic Nanoparticles	**Ch. # 18** From **1**, **Ch. # 18** From **3**, **Ch. # 1** From **4**, **L2** From **7**
Week 3	Structure and Phase Transitions in Nanocrystals	**Ch. # 2** From **1**, **L3** From **7**
Week 4	Clusters	**Ch. # 6** From **1**, **Ch. # 1** From **2**, **L4** From **7**
Week 5	Nanodispersion	**Ch # 11. & Ch. # 12** From **1**, **L5** From **7**
Week 6	Midterm Exam	**L1, L2, L3, L4, L5** From **7**
Weeks 7, 8	Synthetic Methods for nanomaterials / Chemistry aspects	**Ch. # 15, Ch. # 16, Ch. # 17** From **1**, **L6, L7** From **7**

Weeks 9, 10	Dendrimers	**Ch. #18** From **3**, **Ch. # 8** From **4**, **L8, L9** From **7**
Weeks 11, 12	Nano porous Solid Materials	**Ch. # 26** From **1**, **Ch. # 18** From **5**, **L10, L11** From **7**
Weeks 13, 14	Composites & Nanocomposites	**Ch. # 14** From **1**, **Ch. # 7** From **6**, **L12, L13** From **7**
Week 15	Selected Application of Nanomaterials	**L14** From **7**
Week 16	Final Exam	**L6 - L13** From **7**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	**Course Outcome Weight (Out of 100%)**	**Assessment method**
By the end of the course, the students are expected to Explain the differences between bulk and nanomaterial properties [5L9K1]	5%	
By the end of the course, the students are expected to explain the effects of quantum confinement on the electronic structure and corresponding physical and chemical properties of materials at the nanoscale. [7L9K1]	7%	
By the end of the course, the students are expected to achieve the ability to choose appropriate synthesis techniques to synthesize different nanomaterials of desired properties: size, shape, and surface properties. [15L9K3]	15%	
By the end of the course, the students are expected to correlate properties of nanomaterials with their size, shape, and surface characteristics. [8L9K3]	8%	
By the end of the course, the students are expected to appreciate the enhanced sensitivity of nanomaterial-based sensors and their novel applications. [6L9S1, 5L9C2]	11%	
By the end of the course, the students are expected to explain the synthesis of such nanomaterials from chemistry aspects. [6L9S1, 6L9C2]	12%	
By the end of the course, the students are expected to be able to discuss the benefits and use of dendrimers [10L9S2, 4L9C1]	14%	
By the end of the course, the students are expected to be able to discuss the benefit and use of Nanoporous materials [8L9S2, 6L9C1]	14%	
By the end of the course, the students are expected to be able to discuss the benefit and use of Nanocomposite [7L9S2, 7L9C1]	14%	

Relationship to NQF Outcomes (Out of 100%)					
L9K1	L9K3	L9S1	L9S2	L9C1	L9C2
12	23	12	25	17	11

Evaluation	
Assessment Tool	**Weight**
Midterm exam	35%
Final Exam	50%
Homework & Quizzes	5%
Term Paper	10%

Policy	
Exams	- Applied project and term papers are required for graduate students. - Plagiarism laws will be enforced on all class assignments, papers, projects, and tasks. - Exams Could be a mix of (Short essays, short answers, multiple choice, fill-in-the-blank, matching, etc.). They cover all lectures including all readings, lectures, handout material, and postings on the E-Learning module. - Exam makeup is accepted only for emergencies. Students absent from an examination must report immediately to the graduate registrar?s office following JUST regulation. A student who is absent on account of illness must submit a medical certificate evidence. No make-up for quizzes -During exams * You are not allowed to access or consult any materials, resources, websites, or applications (both hardcopy and digital) that your examiner has not provided as part of the exam questions and any accompanying appendices (where applicable). * You are not allowed to communicate with another student during the exam, nor look at another?s answers. * You may not leave the exam until the midway point of the examination time. * You may not continue writing after the supervisor has announced the end of the examination. * You must ONLY use blue or black pens (no pencils). * You must provide your materials (pens, calculators, etc.). No spare materials will be provided, and no material in an exam may be shared. * Late students are allowed to enter the exam room during the first half midway point of the examination time, but they will not be given any extra time.
Cheating	Prohibited; The commitment of the acts of cheating and deceit such as copying during examinations, altering examinations for re-grade, plagiarism of homework assignments, and in any way representing the work of others as your own is dishonest and will not be tolerated. Standard JUST policy will be applied. المادة 7: إذا ضُبط الطالب أثناء الامتحان أو الاختبار متلبساً بالغش فتوقع عليه العقوبات التالية مجتمعة: أ- اعتباره راسباً في ذلك الامتحان أو الاختبار. ب- الغاء تسجيله في بقية المساقات المسجل لها في ذلك الفصل. جـ- فصله من الجامعة لمدة فصل دراسي واحد، و هو الفصل التالي للفصل الذي ضبط فيه.
Attendance	- Attendance is mandatory and will be recorded regularly. - Excellent attendance is expected. - Students who miss more than 20% of the classes will be dropped from the course as per JUST policy. - If you miss class, it is your responsibility to find out about any announcements or assignments you may have missed.

Date Printed: 2026-03-04