Jordan University of Science and Technology

Faculty of Institute Of Nanotechnology

Nanotechnology And Engineering Department

NANO715 Special Topics In Nanotechnology A - JNQF Level: 9

Second Semester 2025-2026

Course Catalog
3 Credit Hours. The course presents a guide through the fundamental concept of biosensing and its integral components. It unravels the role of nanotechnology in advancing biosensors and bioelectronics, with specific exploration of nanomaterial applications in tumor biosensing. It explores the transformative impact of carbon nanostructures, including single-walled carbon nanotubes, multi-walled carbon nanotubes, graphene, and fullerenes, within the realm of biosensors and bioelectronics. Focusing on diverse materials, the course then zeroes in on metal, metal oxides, and quantum dot-based biosensing, providing a comparative assessment of recent developments categorized into novel and improved sensing techniques. Additionally, it investigates the pivotal role of one-dimensional nanomaterials in shaping innovative biosensors. Moreover, it sheds light on the synergies between proteins and nanomaterials, emphasizing their advantages in crafting sensitive biosensor elements. Simultaneously, it delves into exploring dendrimer-based biocomposites and their applications in biosensing. The course delves into a comprehensive examination of nanotechnology techniques employed in DNA sensing.
Teaching Method: On Campus

Text Book	
Title	Nanomaterials for Biosensor
Author(s)	Challa Kumar
Edition	1st Edition
Short Name	ref1
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
ref2	Biosensors Nanotechnology	Ashutosh Tiwari, Anthony P.F. Turner	1st Edition	
ref3	Nanotechnology and Nanosensors	Hossam Haick	1st Edition	

Instructor	
Name	**Prof. Rami Oweis**
Office Location	Institute of Nanotechnology, First Floor.
Office Hours	
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Class Schedule & Room
Section 1: Lecture Time: Mon : 09:00 - 12:00 Room: NANO 1

Tentative List of Topics Covered

Weeks	Topic	References
Week 1	Introduction to nano-based biosensors, lecture notes to be taken by students	
Week 2	Introduction to nano-based biosensors, lecture notes to be taken by students	
Weeks 3, 4	Carbon nanostructures-based sensors	From **ref1**, From **ref2**, From **ref3**
Weeks 5, 6	Metal and metal oxide nanoparticle-based sensors	From **ref1**, From **ref2**, From **ref3**
Weeks 7, 8	Quantum dot-based sensors	From **ref1**, From **ref2**, From **ref3**
Weeks 9, 10	Nanotubes, nanowires, and nanocantilevers in biosensor development	From **ref1**, From **ref2**, From **ref3**
Weeks 11, 12	Dendrimer-based electrochemical detection methods	From **ref1**, From **ref2**, From **ref3**
Weeks 13, 14	Protein-based biosensors using nanomaterials	From **ref1**, From **ref2**, From **ref3**
Weeks 15, 16	DNA biosensors based on nanomaterials	From **ref1**, From **ref2**, From **ref3**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	Course Outcome Weight (Out of 100%)	Assessment method

Gain a thorough understanding of the fundamental concepts and components of biosensing, including its classification, characteristics, applications, and challenges. [1L9K2, 1L9K3, 1L9S2, 1L9C2, 1L9C4]	10%	
Acquire proficiency in the pivotal role of nanotechnology, particularly in enhancing and developing biosensors and bioelectronics. [1L9K2, 1L9K3, 1L9S2, 1L9C2, 1L9C4]	10%	
Understand the role of carbon-based nanostructures in enhancing biosensors and develop expertise in recent advancements related to carbon nanostructures, including single-walled carbon nanotubes, multi-walled carbon nanotubes, graphene, and fullerenes, within the field of biosensors and bioelectronics. [1L9K1, 1L9K2, 1L9K3, 1L9S1, 1L9S2, 1L9C2, 1L9C4]	10%	
Focus on metal, metal oxides, and quantum dot-based biosensing, and conduct a comparative assessment of recent developments, categorized into various novel and improved sensing techniques [1L9K1, 1L9K2, 1L9K3, 1L9S1, 1L9S2, 1L9C2, 1L9C4]	10%	
Investigate the role of one-dimensional nanomaterials in developing innovative biosensors, understanding their unique properties and applications.	10%	
Understand and apply the advantages of combining proteins and nanomaterials for crafting sensitive biosensor elements. [1L9K1, 1L9K2, 1L9K3, 1L9S1, 1L9S2, 1L9C2, 1L9C4]	10%	
Explore dendrimer-based biocomposites and their applications in biosensing, gaining insights into their construction, properties, and practical uses. [1L9K1, 1L9K2, 1L9K3, 1L9S1, 1L9S2, 1L9C2, 1L9C4]	10%	
Delve into various nanotechnology techniques employed in DNA sensing, acquiring skills in molecular-level analysis and detection. [1L9K1, 1L9K2, 1L9K3, 1L9S1, 1L9S2, 1L9C2, 1L9C4]	10%	
Develop the ability to critically analyze recent advancements in biosensing and nanotechnology, evaluating their implications and potential contributions to the field. [1L9S1, 1L9S2, 1L9C1, 1L9C2, 1L9C3, 1L9C4, 1L9C5]	10%	
Foster interdisciplinary thinking by integrating knowledge from various domains, combining biological principles with material science and nanotechnology. [1L9S1, 1L9S2, 1L9C1, 1L9C2, 1L9C3, 1L9C4, 1L9C5]	5%	
Cultivate a mindset of innovation, applying acquired knowledge to contribute novel ideas and approaches in the development of biosensors and bioelectronics. [1L9S1, 1L9S2, 1L9C1, 1L9C2, 1L9C3, 1L9C4, 1L9C5]	5%	

Relationship to NQF Outcomes (Out of 100%)									
L9K1	L9K2	L9K3	L9S1	L9S2	L9C1	L9C2	L9C3	L9C4	L9C5
7.14	11.14	11.14	10	14	2.86	14	2.86	14	2.86

Evaluation	
Assessment Tool	**Weight**

Midterm Exam	30%
Term Project	20%
Final Exam	50%

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