

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Nanotechnology		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	MPH 403		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	UGx11 4	Semester of Delivery	
Administering Department	Medical Physics	College	College of Applied Medical Sciences
Module Leader	Prof. Dr. Hikmat Adnan	e-mail	hikmatadnan@gmail.com
Module Leader's Acad. Title	Asst. Lect	Module Leader's Qualification	M.Sc
Module Tutor	Prof. Dr. Hikmat Adnan	e-mail	hikmatadnan@gmail.com
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Scientific Committee Approval Date	21-10-2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	



أ.م.د. هيكمت عدنان
2026/10/21



Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To become familiar with the fundamental concepts and scientific principles of nanotechnology. 2. To understand the properties of nanomaterials and the methods used for their preparation and characterization. 3. To study the effect of nanoscale size on the physical and chemical properties of materials. 4. To become familiar with the applications of nanotechnology in medical, engineering, and industrial fields. 5. To develop students' scientific thinking and analytical skills. 6. To recognize the importance of nanotechnology in modern scientific and technological advancements.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge and Understanding: Define nanotechnology and explain its fundamental concepts and principles. 2. Intellectual Skills: Interpret the properties of nanomaterials and distinguish them from conventional materials 3. Scientific Skills: Explain the methods used to synthesize nanomaterials and the techniques used for their characterization. 4. Practical Skills: Identify the applications of nanotechnology in medical, engineering, and industrial fields. 5. Analysis and Inference: Analyze the effects of nanoscale size on the physical and chemical properties of materials. 6. General Skills: Evaluate the benefits and potential risks of nanotechnology, taking into account safety and sustainability requirements.
Indicative Contents المحتويات الإرشادية	Theoretical Lectures 1. Introduction to Nanotechnology: Introducing the concept of nanotechnology, its origins, and historical development; explaining its importance and role in scientific and technological advancement; and identifying its major applications in science, engineering, and industry. 2. Fundamental Concepts of Nanoscience: Studying the nanoscale and its dimensions, identifying nanomaterials and their classifications, and distinguishing conventional materials from nanomaterials in terms of size, structure, and properties. 3. Properties of Nanomaterials: Studying the physical, chemical, optical, electrical, magnetic, and mechanical properties of nanomaterials, and understanding the effects of reduced size and increased surface area on material behavior and applications.

	4. Classification and Types of Nanomaterials: Identifying nanoparticles, nanotubes, nanowires, thin films, and nanocomposite materials, while explaining the properties of each type and its major applications. 5. Methods of Nanomaterial Synthesis: Studying the fundamental principles of nanomaterial synthesis methods, including physical, chemical, and biological methods; introducing the top-down and bottom-up approaches; and identifying the factors affecting particle size, shape, and distribution. 6. Characterization and Analysis Techniques for Nanomaterials: Introducing the major techniques used to investigate and determine the properties of nanomaterials, such as scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD), and spectroscopic analysis, while explaining their roles in determining particle size, morphology, composition, and crystal structure. 7. Applications of Nanotechnology in Medicine: Studying the applications of nanomaterials in drug delivery, medical diagnostics, bioimaging, biosensor development, and the advancement of materials used in modern medical applications. 8. Applications of Nanotechnology in Industrial and Engineering Fields: Identifying the role of nanotechnology in developing advanced materials, improving coating properties, manufacturing composite materials, advancing electronics and sensors, and enhancing the efficiency of various industrial processes. 9. Applications of Nanotechnology in Energy and the Environment: Studying the use of nanomaterials in solar cells, energy storage, batteries, water treatment, pollutant removal, and the development of more efficient technologies for environmental sustainability. 10. Safety and Risks Associated with Nanotechnology: Identifying the potential health and environmental risks of nanomaterials, routes of exposure, preventive measures, safe laboratory handling procedures, and the importance of complying with safety standards during their preparation and use. 11. Modern Applications and Future Trends: Exploring recent research developments and innovations in nanotechnology, studying its role in advancing medical, industrial, and engineering sciences, and examining its future potential and the challenges facing its applications.
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	12. Ethical and Regulatory Aspects of Nanotechnology: Identifying the ethical and scientific considerations associated with the development and use of nanomaterials, understanding the importance of risk assessment and compliance with regulatory standards, and balancing the benefits of modern applications with the protection of human health and the environment. 13. Educational Activities and Applications: Using scientific examples, research studies, presentations, and scientific discussions to enhance students' understanding of theoretical concepts, develop their analytical and inferential skills, and connect scientific knowledge with the practical applications of nanotechnology.
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Theoretical lectures and scientific discussions. 2. Interactive learning and brainstorming. 3. Problem-based learning. 4. Collaborative learning and teamwork. 5. Presentations and research discussions. 6. Use of digital educational tools and scientific simulations. 7. Practical learning through laboratory experiments, where facilities and resources are available.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	52	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3.4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	45	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	97+3 فاينل = 100 ساعة		

Course Assessment					
		Time / Number	Weight (Marks)	Weeks	Learning Outcomes
Formative Assessment	Quizzes / Tests	2	10	3,7	1,2
	Assignments	1	5	14	All
	In-Class Assignments	1	5	11	All
	Project	1	10	12	5,6
	Reports	2	10	4,8	All
Final Assessment	Midterm Examination	1	10	8	
	Final Examination	1	50	16	
Total Assessment			100 درجة		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Nanoscience
Week 2	Nanoscience and Nanotechnology
Week 3	Historical Development of Nanotechnology
Week 4	Fundamentals of Nanotechnology
Week 5	Methods of Nanomaterial Synthesis
Week 6	Characterization of Nanomaterials
Week 7	Physical Methods
Week 8	Midterm Examination
Week 9	Chemical Methods
Week 10	Biological Methods
Week 11	Applications of Nanotechnology in Medicine

Week 12	Applications of Nanotechnology in Industry
Week 13	Applications of Nanotechnology in Agriculture
Week 14	Properties of Nanomaterials
Week 15	Final Examination

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Nanotechnology handbook Third Edition .2019,Mark L .Brusseau,Ian L.Pepper and Charles P.Gerba	Yes
Recommended Texts	Application of Nanotechnology	No
Websites	All websites related to nanotechnology.	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C - Good	جيد	70 - 79	Sound work with notable errors
	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

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