MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Biophysics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	فيزياء حياتيه وصفUOMU0301022				
ECTS Credits	**5**				
SWL (hr/sem)	١٢٥				
Module Level	1		**Semester of Delivery**	٢	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Hamza abbas jawad		**e-mail**	hamza.abbas.jawad@uomus.edu.ia	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1- Review in detail several important modern physical science concepts, models, laws, tools and techniques that can be applied to addressing real biological questions. 2-Using of the Physical science methods providing enormous breakthroughs in our understanding of fundamental biology - stemming from the early development of optical microscopy in understanding the cellular nature of life, through to complex structural biology techniques to elucidate the shape of vital biomolecules including proteins and DNA. 3- Introduce the key biological macromolecules, the forces that are involved in maintaining their structure and how structure is determined. 4- Discuss key physical science developments that have involved methods to study single cells in their native context, single- molecule biophysical methods that permit dynamic and mechanistic information to be extracted with unprecedented precision, and ground-breaking developments in areas of super-resolution imaging and biosensing. 5- Discuss tools and techniques that, broadly, permit the detection and characterization of biological material using non-visible electromagnetic radiation, and methods used to manipulate and quantify biological forces, with particular emphasis throughout placed on real applications. Examples of such tools discussed include electron microscopy, nuclear magnetic resonance spectroscopy and atomic force microscopy. We will also discuss optical and magnetic tweezers for single biological molecule manipulation, ion channel measurements in living cells and core physics concepts of fundamental biological processes which are interrogated using these modern instruments.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The module will focus on a number of concepts, models, laws, tools and techniques of physical science that underpin biophysical methods. It will address a broad range of challenging biological questions. During this module students will: 1-Comprehend the use of physical concepts and laws to produce models of biological systems, and quantitatively analyse these models. 2-Critically analyse the validity of assumptions made in these models and assess their impact on the validity of the results.

	3-Understand the physical basis of experimental techniques used to study the biological systems introduced and explain the key results. 4-Assess the key features and biological significance of the systems introduced. 5-Demonstrate an understanding of the key physical principles behind several important biological processes underpinning living matter. 6-Apply modern biophysical tools and techniques to real applications
Indicative Contents المحتويات الإرشادية	The characterization of molecular structure, the measurement of molecular properties, and the observation of molecular behavior presents an enormous challenge for biological scientists. A wide range of biophysical techniques have been developed to study molecules in crystals, in solution, in cells, and in organisms. These biophysical techniques provide information about the electronic structure, size, shape, dynamics, polarity, and modes of interaction of biological molecules. Some of the most exciting techniques provide images of cells, subcellular structures, and even individual molecules. It is now possible, for example, to directly observe the biological behavior and physical properties of single protein or DNA molecules within a living cell and determine how the behavior of the single molecule influences the biological function of the organism. Much biophysical research involves either the development of novel techniques to investigate the structure, properties, and biological functions of biomolecules or the application of these techniques to monitor how the structure and dynamics of biomolecules enables specific biological functions. Information about specific biophysical techniques is provided here.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Some suggestions are sketched concerning the positive impact the introductory lecture on biophysics could have on the undergraduate students. The basic idea is that, especially with this occasion, the teachers have the opportunity to emphasize the role, importance and impact of biophysics on the approach of living matter. The introductory lecture should be a very impressive and challenging one, aiming to attract the students towards this fascinated field of life sciences. However, these suggestions do not preclude the possibilities offered by the other lectures to make short incursions into the past or present life of biophysicists and to emphasize their remarkable scientific achievements.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	٦٩	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	٤
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	٦٥	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	٢٥
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	١٢٥		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	20% (20)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبو النظري	
	Material Covered

Week 1	Introduction - Pressure And Hydrostatic Pressure
Week 2	Introduction And Basic Concepts In Kinematics
Week 3	Torques And Levers In Human Body
Week 4	Basic Concepts Of Electricity
Week 5	Electricity In The Nervous System
Week 6	Excited Nerve Cell Electricity
Week 7	Electrocardiography - Ecg Signal
Week 8	Introduction To Fluid Dynamic
Week 9	Circulatory System And Haemodynamic
Week 10	Introduction To Optics And Vision
Week 11	Eye Anatomy And Vision Process
Week 12	Emmetropia Vs Vision Defects
Week 13	Sound Interaction With Matter And Sonography
Week 14	Biological Effects Of Ionizing Radiation
Week 15	Sound Wave In Media
Week 16	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبو للمختبر	
	Material Covered
Week 1	Lab 1: Determining solution concentrations using a refractometer and a polarimeter
Week 2	Lab 2: Fermat's principle, the law of light refraction, the law of light reflection
Week 3	Lab 3: Phenomenon of the total internal reflection of light
Week 4	Lab 4: Operation principle of the refractometer
Week 5	Lab 5: Applications of polarimetry in diagnostics

Week 6	Lab 6: Types of concentrations: weight to weight, weight to volume, molar and normal
Week 7	Lab 7: Optical birefringence

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Leake MC: Biophysics: tools and techniques (CRC Press, 1st Ed, 2016) Leake MC: Single-Molecule Cellular Biophysics (CUP, 1st Ed, 2013)	Yes
Recommended Texts	Alberts A et al: Molecular Biology of the Cell (Garland Science, 6th Ed, 2014)	No
Websites	https://www.nature.com/subjects/biophysical-methods#:~:text=Biophysical%20methods%20are%20techniques%20to,molecule%20methods%20and%20molecular%20modelling.	

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.