Academic Program Description Form

University Name: Al-Nahrain

Faculty/Institute: Science

Scientific Department: Medical physics

Academic or Professional Program Name: Medical physics

Final Certificate Name: Medical physics

Academic System: Bologna

Description Preparation Date: 14/9/2025

File Completion Date: 21/9/2025

Signature: Alaa

Head of Department Name: Prof.
Prof. Dr. Alaa Jabbar Ghazai

Date:

Signature:

Scientific Associate Name:
Manaf Adnan Salch

Date:

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date:

Signature:

Approval of the Dean

Asmaa Hadi Mohammed

First course

Semester One

Level one

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	DEMOCRACY AND HUMAN RIGHTS			**Module Delivery**	
Module Type	BASIC			☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	URDEM				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	1		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Ihab Ntiq khalid		**e-mail**	ihab.natiq@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Lecturer		**Module Leader's Qualification**	Ph.D	
Module Tutor	None		**e-mail**	E-mail	
Peer Reviewer Name	Ihab Ntiq khalid		**e-mail**	ihab.natiq@nahrainuniv.edu.iq	
Review Committee Approval			**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 Aims أهداف المادة الدراسية	The goal of studying human rights and democracy is to enhance understanding and awareness of human rights issues and the fundamental principles of democracy. There are several key objectives in studying this subject: 1. Understanding human rights: The study of human rights aims to familiarize you with the core concepts of human rights and their fundamental value in society. You will learn about the history and legal development of human rights, as well as the international treaties and agreements related to this subject. 2. Awareness of the core principles of democracy: You will become acquainted with the concept of democracy and its core values, including the rule of law, citizenship rights, and political participation. You will also learn about different systems of governance and how democratic principles are applied in different societies. 3. Familiarity with current challenges: You will learn about current challenges and issues in the field of human rights and democracy. You will study issues related to discrimination, social justice, women's rights, minority rights, children's rights, and refugee rights, as well as how to address these challenges within a democratic framework. 4. Application of concepts to real-world situations: You will learn how to apply the concepts and principles studied in human rights and democracy to practical situations. You will study the various roles of human rights organizations and democratic institutions, and how to work towards promoting human rights and enhancing democracy in societies. 5. Development of critical and analytical skills: You will learn how to analyze issues related to human rights and democracy and evaluate the legal, ethical, and political contexts surrounding them. You will practice formulating strong arguments and providing constructive criticism of unjust policies and practices. By studying human rights and democracy, you will acquire the necessary knowledge and understanding to contribute to the promotion of human rights and democracy in society and work towards creating positive

	change.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The University of Al-Nahrain works through teaching the subject of human rights and democracy to promote education, awareness, and train students on the importance of active participation in various aspects of public life. This includes promoting respect for the principles of human rights, active engagement in political and cultural life, and fostering values, beliefs, and positions that encourage all students to support their own rights and the rights of others. It also facilitates an understanding of the shared responsibility of this group in making human rights a lived reality, equipping them with knowledge, skills, and attitudes that enable them to comprehend these rights and adhere to them.
Indicative Contents المحتويات الإرشادية	-Understanding the concept of rights and the concept of human beings, both linguistically and terminologically, and understanding the concept of human rights and studying the legal personality of humans, as well as the characteristics of natural persons. - Understanding the historical development of the idea of human rights in ancient and medieval eras, and the concept of human rights in divine scriptures. - Studying the sources of local and international human rights. - Studying the guarantees of human rights and understanding constitutional and judicial guarantees, as well as guarantees of human rights in Islam. - Understanding the role of organizations in human rights at the regional and international levels. - Studying the impact of globalization on human rights. - Studying the concept of democracy, its evolution, definition, and dimensions. - Studying representative democracy and understanding the representative system and its legal nature. - Understanding the concept of elections and its legal adaptation. - Understanding the organization of elections, including the delineation of electoral districts, electoral lists, candidates, election campaigns, and voting. - Studying electoral systems and understanding direct elections, indirect elections, individual elections, and list-based elections. -Understanding the advantages and disadvantages of democracy.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. POWERPOINT 2. Writing reports 3. Online learning 4. Field visits

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #3,4, 8 and 9
	Assignments	2	10% (10)	2, 12	LO # 2,11and 12
	Report	1	5% (5)	7	
	Seminar	1	15% (15)	13	
Summative assessment	**Midterm Exam**	1 hr	10% (10)	14	LO # 1-13
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	The concept of human rights
Week 2	Human rights in ancient civilizations
Week 3	Human rights in divine laws and religions
Week 4	Human rights resources
Week 5	Human rights guarantees and means of protecting them
Week 6	The role of organizations in protecting human rights
Week 7	Globalization and human rights
Week 8	The concept of democracy and Representative democracy.
Week 9	The concept of election and its legal adaptation

Week 10	Organizing the election process and Election systems
Week 11	Formation of the electorate
Week 12	Obstacles and Foundations of Good Governance
Week 13	Disadvantages and advantages of democracy
Week 14	**Mid Exam**
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Maher Saleh Allawi Al-Jubouri, Human Rights, Children and Democracy, The Law Library, 2009	YES
Recommended Texts	Dr. Hamid Hanoun Khaled, Human Rights, Al-Sanhouri Library, 2015	NO
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Fundamental of Mechanics			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code	MPHY1101				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level		1	**Semester of Delivery**		1
Administering Department		MPHY	**College**	College of Science	
Module Leader	Dr. Haneen Akram		**e-mail**	Haneenakram837@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Teacher	**Module Leader's Qualification**		PhD
Module Tutor	Rafah Mohammed Hussien		**e-mail**	rafah.m.h@nahrainuniv.edu.iq	
Module Reviewer			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 Aims أهداف المادة الدراسية	Mechanics is one of the basic subjects for first year students in colleges of science. The aim of this semester is to provide the student with knowledge of the foundations of classical physics, including the laws of motion, equilibrium, concepts of energy and work, and other important concepts.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Providing the student with the basic concepts of the laws of motion. 2. Learning basic concepts on which physical laws depend, such as equilibrium, conservation of energy and work. 3. Providing the student with scientific experience, practical skills and solving scientific problems using simplified mathematical methods
Indicative Contents المحتويات الإرشادية	Chapter One: Vector Algebra Chapter Two: Laws of Motion Chapter Three: Newton's Laws of Motion Chapter Four: Energy Chapter Five: Momentum and Collision

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The learning strategy depends on the following: 1. Feeding the student with theoretical foundations and concepts from theoretical lectures 2. Daily and semester tests 3. Assigning students to solve the required mathematical problems and discussing them during the class

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	135	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	5% (5)	Continuous	All
	Lab	1	15% (15)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO # 1-7
	Final Exam	4hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Chapter One: Introduction to vector algebra, vector values and eigenvalues, types of vectors, addition and subtraction of vectors.
Week 2	Scalar and vector multiplication, triple scalar and vector multiplication, descent, solving math problems and homework.
Week 3	Chapter Two: Units and their conversions, displacement, velocity, acceleration, laws of uniform linear motion in one dimension.
Week 4	Free fall, problem solving and homework.
Week 5	Laws and applications of laws of motion in two directions, examples and assignments.
Week 6	Chapter Three: Newton's Laws of Motion (First, Second and Third Laws).
Week 7	Applications of Newton's laws of motion.
Week 8	Mid Exam
Week 9	Chapter 4: Energy, Work, Examples and Homework.
Week 10	Work and energy theory, examples and applications.
Week 11	Gravitational potential energy, examples and applications.
Week 12	Spring potential energy, applications and examples.

Week 13	Chapter 5, Momentum and Collision.
Week 14	Law of conservation of momentum, collision, examples and applications.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Instructions to students, Basic personal needs and other requirements. Writing the account of an experiment, Introduction to graphical representation of experimental data, Errors, their determination and minimization, least square fitting. Units.
Week 2	Lab 2: Graph Lab
Week 3-4	Lab 3: Forces and Equilibrium
Week 5-6	Lab 4: Hooks Law
Week 7-8	Lab 5: Spiral Spring: Determination of force constant and effective mass of a spring.
Week 9-10	Lab 6: Simple Pendulum
Week 11-12	Lab 7: The bifilar suspension
Week 13	Lab 8: The bifilar suspension
Week 14	Mid Exam
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	College Physics, Raymond, A. Serway, Eight edition, USA, 2009	YES
Recommended Texts	University Physics, SAMUEL J. LING, Volume 2, 2021	YES
Websites	https://fizikamentor.wordpress.com/wp-content/uploads/2018/04/college-physics.pdf https://faculty.ksu.edu.sa/sites/default/files/physics_serway.pdf	

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GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	MATHEMATICS		**Module Delivery**	
Module Type	SUPLEMENT		☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	CREQ1101			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	1		**Semester of Delivery**	1
Administering Department	MPHY		**College**	College of Science
Module Leader	Eman Khaled		**e-mail**	Eman.Khaled@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MSc
Module Tutor			**e-mail**	
Module Reviewer				
Peer Reviewer Name			**e-mail**	
Review Committee Approval			**Version Number**	

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 Aims أهداف المادة الدراسية	The aim of this course is for student to gain proficiency in computations. In calculus, we use two main tools for analyzing and describing the behavior of functions: limits and derivatives. Students will use these tools to solve application problems in a variety of setting ranging from physics and chemistry to business and economics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To determine the solution set of inequalities involving absolute value, 2. To determine domain, range and operation of someone variable functions and the graphs. 3. To determine limit and continuity of one variable functions. 4. To determine derivate of one variable functions. 5. To determine the solution of problems involving the derivate of one variable function. 6. To determine inverse function and its derivative. 7. To learn about application of derivatives.
Indicative Contents المحتويات الإرشادية	8. Real number, inequalities, absolute value, Cartesian coordinate system, function and its graph, operation on function, trigonometry function. 9. Definition, theorems of limit, trigonometry function limit, limit on infinity, infinite limit, continuity function, 10. Definition and rule of derivate, derivate of trigonometry function, chain rule, higher order derivate, implicit derivate, related rate, basic concept of differential, 11. Maximum and minimum, monotonicity and concavity, graphing one variable function, mean value theorem for derivate. 12. Natural logarithm function, inverse function and its derivate, natural exponential function, general exponential function, general logarithm function, hyperbolic function and its inverse.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will be presented to the students through a specified series of lectures, supported by problem solving practice carried out in interactive tutorials. These tutorials will be supported by practice and directed study outside the classroom. Formative assessment takes place throughout the module during tutorials and feedback is given during these tutorials.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	10% (10)	2, 5, 10, 12	LO #1, 2, 10 and 11
	Online Assignments	2	10% (10)	Continuous	All
	Onside Assignments	2	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Functions and their graphs**.
Week 2	**Trigonometric functions**.
Week 3	**Exponential function, inverse functions, logarithms.**
Week 4	**Derivative: motivation. Informal definition of limits**
Week 5	**Limit laws. Squeeze theorem.**
Week 6	**Continuity, asymptotes.**
Week 7	**Definition of derivative. Derivative as a function**.
Week 8	**Derivative of polynomials. Product and quotient rule**
Week 9	**Derivatives of trig functions**
Week 10	**Chain rule, implicit differentiation.**
Week 11	**Derivative of the logarithm. Applications**
Week 12	**L'Hospital's rule, more graph sketching and Anti derivatives.**

Week 13	**statistics**
Week 14	**Mid Exam**
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Calculus and Analytic Geometry Thomas International, edition 30th edition in 2014	YES
Recommended Texts	Schaumu's series, 6th edition in 2013	YES
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
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MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Analytical chemistry			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code	CREQ1105				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	1		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Talib Hamid Mawat		**e-mail**	Dr.talib_h@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor	Shams aws ismael		**e-mail**	Shams.aws@nahraininiv.edu.iq	
Module Reviewer	Dena ahmed hashem			Dina.ahmed@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 Aims أهداف المادة الدراسية	1. Introduction to Analytical Chemistry, focusing on why analytical chemistry is important and outlining the fundamental steps a professional chemist follows when solving analytical problems. 2. Comprehensive introduction to mass and volume concepts in chemistry, leading to a clear and practical understanding of the mole concept. 3. Development of core knowledge of concentration units used in analytical chemistry, including the relationships between these units and the ability to convert accurately from one to another. 4. Study of stoichiometry with direct emphasis on its connection to the mole concept and chemical calculations. 5. Foundational understanding of gravimetric analysis and solubility principles as applied in analytical chemistry.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learn proper approaches for understanding and analyzing analytical problems. 2. Introduce the fundamental definitions and concepts of volumetric and gravimetric analysis. 3. Develop a solid understanding of the mole concept and its application in stoichiometry. 4. Understand the principal units used in analytical chemistry and their significance. 5. Provide a general introduction to solubility and the common-ion effect. 6. Enhance students' ability to convert between units and handle numerical calculations accurately. 7. Build the ability to select an appropriate analytical method for a given analytical problem. 8. Develop skills in balancing chemical equations and performing stoichiometric calculations. 9. Establish basic laboratory skills for handling chemicals and applying simple methods for elemental detectio
Indicative Contents المحتويات الإرشادية	1. Areas of Chemical Analysis 2. The Modern Role of the Analytical Chemist 3. Main Branches of Analytical Chemistry 4. Classification of Quantitative Analytical Methods 5. Analytical Methodology and Problem-Solving Strategy 6. The Concept of the Mole (mol) 7. Molar Mass (Molecular Weight) 8. Mole-Based Calculations 9. Concentration Units in Analytical Chemistry: a. Molarity and Normality b. Molality

	c. Dilution Principles d. Volume per Volume (% v/v) e. Weight per Weight (% w/w) f. Weight per Volume (% w/v) g. Parts per Million (ppm) and Parts per Billion (ppb) Interconversion of Concentration Units Stoichiometry in Chemical Analysis Limiting and Excess Reagents Solubility and the Solubility Product (Ksp) The Common-Ion Effect
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Interactive classroom lectures supported by educational videos to enhance understanding and engagement. • Practical laboratory sessions focused on applying theoretical concepts and developing hands-on analytical skills. • Student-centered interactive teaching, where questions are raised during lectures and students work individually or in groups to explore and discuss relevant answers. • Weekly tutorials (2 hours) dedicated mainly to practicing and expanding problem-solving skills, with emphasis on numerical and calculation-based questions.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	5% (5)	Continuous	All
	Lab	1	15% (15)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13

assessment	**Final Exam**	4hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1-2	**Learning basics of analytical chemistry and scientific steps of analysis.**
Week 3-5	**Solution preparation and concentration (molecular mass, Moles, Molarity, Molality, Normality, and other concentration units)**
Week 6-8	**units interchange (mol, ppm, ppb, w/w, w/v, v/v)**
Week 9-12	**Stoichiometric Relationships (balancing chemical equation and stoichiometry)**
Week 13	**Gravimetric methods of analysis (solubility and common ion effects)**
Week 14	**Mid Exam**
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Lab introduction and basic glassware.
Week 2	Lab 2: Analysis and identification of Group I Cations (Ag+, Hg22+ and Pb2+ – insoluble chlorides.
Week 3	Lab 3: Analysis and identification of Group I Cations in an unknown sample.
Week 4	Lab 4: Analysis and identification of Group II Cations (Hg2+, Pb2+, Cu2+, Bi3+, Cd2+, As3+, Sb3+ and Sn4+ – insoluble sulphides in acidic.
Week 5	Lab 5: lab review
Week 6	Lab 6: Analysis and identification of Group II Cations in an unknown sample.
Week 7	Lab 7: Analysis and identification of Group III Cations (Al3+. Fe3+, Co2+, Ni2+, Cr3+, Zn2+ and Mn2+ – insoluble sulphides.
Week 8	Lab 8: lab review
Week 9	Lab 9: Analysis and identification of Group III Cations in an unknown sample.
Week 10	Lab 10: Analysis and identification group IV Cations (Ca2+, Sr2+ and Ba2+ – carbonate precipitates.

Week 11	Lab 11: Analysis and identification of group IV Cations in an unknown sample.
Week 12	Lab 12: lab review
Week 13	Lab 13: Analysis and identification of Group V Cations (Mg2+, Na+, K+ and NH4+)
Week 14	Mid Exam
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamental of analytical chemistry, D.A. Skoog, D. M.West, F. J. Holler and S. R. Crouch, 8th ed., 2004, Brooks/Cole.	YES
Recommended Texts	Analytical chemistry, "Theoretical and Metrological Fundamentals", K. Danzer, 1st ed., 2006, Springer.	NO
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM

نموذج وصف المادة الدراسية

2024-2025

Module Information

معلومات المادة الدراسية

Module Title	Electricity and Magnetisim	**Module Delivery**	
Module Type	CORE		☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**
Module Code	MPHY1102		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	**Semester of Delivery**	1
Administering Department	MPHY	**College**	College of Science
Module Leader	Dr. Salam E Hammeed	**e-mail**	Salam.dulaimi@nahrainuniv.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	PhD
Module Tutor	Tuqa abd albasit	**e-mail**	tuqa.mphs24@ced.nahrainuniv.edu.iq
Module Reviewer		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	
Laboratory staff	**Dr.Manar Thayer Mansour, Dr. Fatimah fadhil abd Ali ,MSc.marwa ahmed , MSc.Ragha Harith**		

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 Aims أهداف المادة الدراسية	1. Understanding the electric charge and the electric field. 2. Knowing the composition of matter. 3. Knowing the types of matter. 4. Knowing the types of electrical charging. 5. Learn about Coulomb's law. 6. Identify the electric field of charges and electric field lines. 7. Identify forces, moments, and electrical potential energy. 8. Knowing the Gauss's law. 9. Identify the electric flux and the enclosed charge. 10. Identify the electrostatic field.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. For students to be able to distinguish between different types of materials and their ability to conduct electricity. 2. Student's ability to charge materials electrically. 3. Students can be able to identify what happens inside electrically charged materials and the movement of charges inside the material. 4. Distinguishing between Coulomb's, Gauss's and Ohm's laws and what students achieve in studying each law. 5. Students' ability to test whether materials are conductive or non-conductive. 6. Students' ability to distinguish between the parts of an electrical circuit while drawing this circuit. 7. Students' ability to perform many calculations such as forces, moments, potential energy, electric flux, resistance, capacitance, etc. 8. The ability of students to apply what has been calculated theoretically in a practical way in the future.		
Indicative Contents المحتويات الإرشادية	- Electric charge, electric field, Conductors, insulators and induced charges. [15 hrs.] - Coulomb's Law, Electric field lines, electric dipole, force and		

	potential energy. [15 hrs.] - Gauss's Law, The electrostatic field, Ohm's Law, Capacitance and resistance. [20 hrs.] - Inductive CCT and Faraday's Law. [15 hrs.]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Discussing the topics of the curriculum book and supporting references Theoretical lectures including problem solving and discussion of homework. - Asking students a set of thinking questions during the lectures for specific topics. - Giving students homework that requires finding self-solutions.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	135	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	5% (5)	Continuous	All
	Lab	1	15% (15)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	4hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**General Introduction**
Week 2	**Electric charge and electric field**
Week 3	**Conductors, insulators and induced charges**
Week 4	**Exercises**
Week 5	**Coulomb's Law**
Week 6	**Electric field lines, electric dipole**
Week 7	**force and potential energy**
Week 8	**Exercises**
Week 9	**Gauss's Law**
Week 10	**The electrostatic field**
Week 11	**Ohm's Law**
Week 12	**Capacitance and resistance**
Week 13	**Faraday's Law**
Week 14	**Mid Exam**
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Lab 1: Ohm's Law
Week 3-4	Lab 2: Non Ohmic
Week 5-6	Lab 3: parallel and series connection of resistance
Week 7-8	Lab 4: Maximum power transfer
Week 9-10	Lab 5: Lenz's law
Week 11-12	Lab 6: Electromotive force (E. m. F)
Week 13	Lab 7: parallel and series connection of capacitor
Week 14	Mid Exam
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Edward M.Purcell, Electricity and magnetism, 3rd edition, 2013	YES
Recommended Texts	University physics with modern physics, 13th edition, 2011	YES
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	NEW HEADWAY PLUSE	**Module Delivery**	
Module Type	BASIC	☒**Theory** ☐**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	URENG1		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	1	**Semester of Delivery**	1
Administering Department	MPHY	**College**	College of Science
Module Leader	Ahmed Mohammed Abid Al-Asady	**e-mail**	ahmed.m.abid@nahrainuniv.edu.iq
Module Leader's Acad. Title	Dr.	**Module Leader's Qualification**	PhD
Module Tutor		**e-mail**	
Module Reviewer			
Peer Reviewer Name		**e-mail**	
Review Committee Approval		**Version Number**	

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 Aims أهداف المادة الدراسية	1. Enable students to acquire knowledge and understanding of the basic grammar rules by testing their knowledge of the correct structure of the English sentence. 2. Enable students to understand the structures of writing and what is required to write a good academic essay. 3. Enable students to use the most efficient method of attacking the reading passage to answer questions correctly in a limited time. 4. Enable students to identify their weaknesses and strengths by assess their tests.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explanation and clarification of the lecture using the whiteboard and the use of video lectures. 2. Making a group discussion during the lectures to discuss topics that require reflection and analysis. 3. Presenting a set of critical thinking questions during the lectures such as what, how, when and why for specific topics. 4. Giving students homework that requires explanations and solving through reasonable methods. 5. Giving students homework that requires explanations in causal ways.
Indicative Contents المحتويات الإرشادية	– The skills goals special to the course. – Ability to independently investigate and resolve an original problem. – Preparation for later advanced study.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	Write something like: The main strategy that will be adopted in introducing this unit is to encourage students to participate in solving homework exercises, while improving and expanding their critical thinking skills. This will be achieved through classes and

	interactive tutorials and by thinking about the type of simple experiments that include some sampling activities that are of interest to the students.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #3,4, 8 and 9
	Assignments	2	10% (10)	2, 12	LO # 2,11and 12
	Report	1	5% (5)	7	
	Seminar	1	15% (15)	13	
Summative assessment	**Midterm Exam**	1 hr	10% (10)	14	LO # 1-13
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Simple present and simple past**
Week 2	**Past and present continuous, Past and present perfect**
Week 3	**Strategies of writing different essays**
Week 4	**General outline of an academic essay**
Week 5	**Writing an academic essay**
Week 6	**Rules 1-3 - every subject has a verb** **- present participles** **- past participles**
Week 7	**Rules 4-6 - coordinate connectors**

	- Adverbial connector **- contrast adverbial connector**
Week 8	**Rules 1-6 (Discussion, questions and typical answers)**
Week 9	**Reading- (Answering main idea questions correctly)**
Week 10	**Reading - Identify the organization of ideas**
Week 11	**Reading Find pronoun referents**
Week 12	**Determine meanings from word parts** **Determine meanings of difficult words**
Week 13	**A review of what was studied in the previous lectures with questions and discussion of typical answers**
Week 14	**Mid Exam**
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Headway- Upper intermediate- 3rd Edition: Liz and John Soars, 2005.	YES
Recommended Texts	Preparation course for the TOEFL TEST- Deborah Phillips, 2003.	YES
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
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First course

Semester Three

Level Two

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	MODERN PHYSICS			**Module Delivery**	
Module Type	CORE			☐**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	6				
SWL (hr/sem)	78				
Module Level			**Semester of Delivery**		
Administering Department	Medical Physics		**College**	Science	
Module Leader	Dr. Manar Thayer Mansour		**e-mail**	manar.thaer@nahrainuniv.edu.iq	
Module Leader's Acad. Title		**Module Leader's Qualification**			
Module Tutor	Marwa Ahmed Mohammed		**e-mail**	marwa.ahmed@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 Aims أهداف المادة الدراسية	**1. Understand the basic principles of modern physics: Focus on principles developed during the 20th century such as relativity, quantum mechanics, and nuclear physics.** **2. Introduce students to new concepts: Quantum energy, particle-wave duality, special and general relativity, and atomic structure.** **3. Motivating students for scientific research: Encourage them to follow the latest developments and discoveries in physics.** **4. The ability to understand and apply basic principles: Understanding the foundations of special relativity, quantum mechanics, and nuclear physics.** **5. The ability to solve complex physics problems: Using the laws and theories of modern physics.**
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**1. Analyze physics data and use mathematical methods and theoretical models to solve complex issues.** **2. Critical thinking and problem solving: The student learns how to use modern physics knowledge to analyze new issues and come up with innovative solutions.** **3. Ability to explain complex natural phenomena: Using the principles of modern physics, such as explaining phenomena associated with high speeds, large masses, or subatomic particles.** **4. Familiarity with the practical applications of modern physics: In the fields of technology, medicine, engineering, and the environment, such as laser applications, magnetic resonance imaging, and renewable energy technologies.** **5. Understanding the basic principles of modern physics: Such as the special theory of relativity, quantum mechanics, and particle physics.**
Indicative Contents المحتويات الإرشادية	**1. : : Introduction to Modern Physics** **- The difference between classical and modern physics** **- The theories that laid the foundations for modern physics such as special relativity and quantum mechanics**

	2. : Special relativity **- The concept of a frame of reference and relative speed** **- The principle of relativity** **- Lorentz transformations** **- The relationship between mass and energy ($E = mc^2$)** **3. quantum theory** **- The wave-particle nature of light (wave-particle duality)** **- The Compton effect** **- Planck's interpretation of blackbody radiation** **- Bohr's model of the atom** **4. : Quantum mechanics** **- Basic principles of quantum mechanics (Heisenberg's uncertainty principle, wave function, quantization of energy)** **- Schrödinger's wave equation** **- Atoms and atomic structures** **5 . Elementary particles :** **- Classification of particles (e.g. quarks and leptons)** **- Basic forces in nature (strong and weak nuclear force, electromagnetism, gravity)** **- The standard model of particles**
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**1 . Inquiry-based learning: Encourages students to ask questions and discover concepts on their own through experiments and research projects, which enhances critical thinking and problem-solving skills.** **2 . Collaborative learning: Encouraging teamwork where students exchange ideas and collaborate in solving scientific questions and experiments.** **3 . Brainstorming and group discussion: This strategy helps to promote group thinking and the cultural exchange of scientific ideas among students.** **4 . Problem-based learning: Students learn physics by facing real issues and solving them using physics tools and concepts.** **5 . Constructive assessment: Using continuous assessment to measure students' progress and understanding of concepts, rather than relying solely on final** exams.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	75	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Special Relativity, Postulates of Special Relativity
Week 2	Time Dilation
Week 3	Doppler Effect , Length Contraction
Week 4	Twin Paradox , Relativistic Momentum
Week 5	Relativistic Mass, Relativistic Second Law
Week 6	Mass and Energy , Energy and Momentum
Week 7	The Lorentz Transformation

Week 8	Velocity Addition
Week 9	Electromagnetic Waves, Blackbody Radiation
Week 10	Photoelectric Effect
Week 11	X-Rays, Compton Effect, Pair Production , photon Absorption
Week 12	De Broglie (Matter) Waves , Describing a Wave
Week 13	Phase and Group, Velocities Particle Diffraction
Week 14	Uncertainty Principle
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Concepts of modern physics** **Arthur Beiser**	
Recommended Texts	**Modern Physics by Paul A. Tipler** **Modern Physics for Scientists and Engineers, by Stephen Thornton**	
Websites	http://library.lol/main/802283D1032C91B4201CACCA52578A98	

	http://library.lol/main/A014282B63FE52E8510AC53A7ED0D0C8 http://library.lol/main/7275D2ADDF609FA6CCAC053E5CC8C9FA

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	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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**ODE**		**Module Delivery**
Module Type	Core		• ☐ **Theory** • ☒ **Lecture** • ☐ **Lab** • ☒ **Tutorial** • ☐ **Practical** • ☒ **Seminar**
Module Code			
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level		**Semester of Delivery**	2
Administering Department	Medical Physics	**College**	Type College Code
Module Leader	Asst. Prof. Dr.Fatimah Al-Taie	**e-mail**	fatimah.altaie@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name		**e-mail**	E-mail
Scientific Committee Approval Date	1-10-2026	**Version Number**	

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 Aims **أهداف المادة الدراسية**	The aim of this course is for the students to be primarily concerned with learning the basic concepts of mathematics, application in reality, solution of ordinary differential equations with first-, and higher-order and their applications. In addition, different classes of ODEs are considered.
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	Learning the basic concepts of differential equations, such as: 1. To be able to deal with ordinary differential equations (ODE) and their applications. 2. To be familiar with first order ODE and learning how to solve such equations. 3. To deal with higher order ODE and their solutions. 4. To learn the difference between homogeneous and non-homogeneous differential equations. 5. To have experience in applications of Laplace transform.
Indicative Contents **المحتويات الإرشادية**	1. Differential Equations: definition, properties, classifications. 2. First-order DE: Types, methods of solution: separable, homogeneous, exact, non-exact, linear, Bernoulli differential equation. 3. Higer-order DE: Definition, homogeneous linear DE., methods of solution. 4. Non-homogeneous DE: definitions, properties, <ethods of solution. 5. Laplace Transform: Definitions, properties, applications.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategy is presented by: Providing the students with a sufficient amount of mathematical terms and definitions by attending lectures and presenting on the whiteboard to connect the students with the lecturer to solve as many real-life applications as possible. The pdf lectures, homework, quizzes, reports, seminar, and exercises are shared on Google Classroom. The subject will be given to the students through a series of lectures with problem-solving practice carried out in interactive tutorials. These tutorials will be supported by practice and directed study outside the classroom. Formative assessment takes place during tutorials and feedback is given during these tutorials.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) **الحمل الدراسي المنتظم للطالب خلال الفصل**	63	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	4.2
Unstructured SWL (h/sem) **الحمل الدراسي غير المنتظم للطالب خلال الفصل**	37	**Unstructured SWL (h/w)** **الحمل الدراسي غير المنتظم للطالب أسبوعيا**	2.46
Total SWL (h/sem) **الحمل الدراسي الكلي للطالب خلال الفصل**	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	2, 6	LO #1, 3
	Assignments	2	10% (10)	3, 8	LO # 2 and 3
	Projects / Lab.	-	10% (10)	continuous	
	Report	1	10% (10)	14	LO # 4, 5
Summative assessment	**Midterm Exam**	2	10% (10)	4,12	LO # 1,2 and 2-4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to DE's: Definition and classification of Differential Equations (DE's)
Week 2	First-order DE's: Separable DE.
Week 3	Homogeneous first-order DE.
Week 4	Exact differential equations
Week 5	Non-exact differential equations.
Week 6	Linear differential equation and Bernoulli equation.
Week 7	Higher-order DE's: The general form of higher-order DE's
Week 8	Homogeneous DE's
Week 9	Definition and methods on solving homogeneous DE's

Week 10	Nonhomogeneous DE's
Week 11	Definition, properties, and methods of solving non-homogeneous DE's
Week 12	Mid-Term Exam
Week 13	Reducing second-order DE to first-order DE
Week 14	Laplace Transform
Week 15	Definition / properties of Laplace transform and then using Laplace transformation in solving DE's
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	[1] C. Henry Edwards and David E. Penney, Differential Equations and Linear Algebra, ser. Pearson International Edition, third edition. Pearson Education, United States of America, 2010. [2] William E. Boyce, and Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John Wiley and Sons, Inc. Seventh edition, United State of America. 2001.	No
Recommended Texts	Earl D. Rainville and Phillip E. Bedient, Elementary Differential Equations, Collier Macmillan Publishers, fifth Edition, New York, 1974.	Yes
Websites	https://www.khanacademy.org/math/differential-equations , www.google.com ,	

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.

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	THERMODYNAMICS			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code					
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	1		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Saif Mohsin Nassrullah		**e-mail**	saif.muhsin@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor	Sarah Abdulkareem Athari		**e-mail**	sara.abdulkareem@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval	16/9/2025		**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 Aims أهداف المادة الدراسية	1. Teaching the student the principles of thermodynamics. 2. Identify the main laws related to the science of heat and work. 3. Learn about real-life practical applications of thermodynamics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student can distinguish between states of matter in addition to the difference between a real gas and an ideal gas. 2. The student can understand the laws of thermodynamics and the mechanism of their application. 3. The student can explain the mechanism between movement and heat and their effects 4. The student can explain the physical difference between heat and cooling. 5. Students' ability to apply what has been calculated theoretically in a practical way in the future.
Indicative Contents المحتويات الإرشادية	- Important terms, Reversible and Irreversible processes, Ideal Gas. [15 hrs.] - Heat Transformation, 1st Law of thermodynamics, The State Equation. [15 hrs.] - Adiabatic Processes, Specific Heat Capacity, Specific Heat Capacity in Adiabatic Processes. [20 hrs.] - 2nd Thermodynamics Law and Carnot Cycle Thermal Machines and Refrigerators . [15 hrs.]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	- Discussing the topics of the curriculum book and supporting references Theoretical lectures including problem solving and discussion of homework. - Asking students a set of thinking questions during the lectures for specific topics. - Giving students homework that requires finding self-solutions.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	65	**Structured SWL (h/w)**	4.3

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	135	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2, 5, 10, 12	LO #1, 2, 10 and 11
	Assignments	6	10% (10)	Continuous	All
	Projects / Lab.	7	5% (5)	Continuous	All
	Report	7	10% (10)	Continuous	All
	Seminar	1	5% (5)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	5hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Important terms**
Week 2	**Reversible and Irreversible processes**
Week 3	**Ideal Gas**
Week 4	**Exercises**
Week 5	**Heat Transformation**
Week 6	**1st Law of thermodynamics**
Week 7	**The State Equation**
Week 8	**Adiabatic Processes**
Week 9	**Specific Heat Capacity**
Week 10	**Specific Heat Capacity in Adiabatic Processes**
Week 11	**Work and Heat Relationship**
Week 12	**2nd Thermodynamics Law**
Week 13	**Carnot Cycle Thermal Machines and Refrigerators**
Week 14	**Mid Exam**

Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Lab 1: Determination of the coefficient of apparent cubic expansivity of a liquid by Mathieson's sinker method
Week 3-4	Lab 2: Entropy of system
Week 5-6	Lab 3: measurement of thermal conductivity by lees disc method
Week 7-8	Lab 4: experiment to measure specific heat capacity of a liquid by method of cooling
Week 9-10	Lab 5: the specific heat capacity of copper by calendar method
Week 11-12	Lab 6: experiment to measure specific heat capacity of a metal by method of mixtures
Week 13	Lab 7: coefficient of linear expansion of copper
Week 14	Mid Exam
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Francis Weston Sears, Thermodynamics, The Kinetic Theory of Gases, and Statistical Mechanics , 2rd edition, 1953	YES
Recommended Texts	Heat and Thermodynamics, Mark W. Zemansky, McGraw Hill, 1968	YES
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**MATHEMATICAL PHYSICS**	**Module Delivery**	
Module Type	CORE		☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**
Module Code			
ECTS Credits	4		
SWL (hr/sem)	63		
Module Level	2	**Semester of Delivery**	3
Administering Department	Medical Physics	**College**	College of Science
Module Leader	Hassan N. Hashim	**e-mail**	hassan.hashim@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	PhD
Module Tutor	Fatimah Fadhil Abd Ali	**e-mail**	fatimahfadhil33@nahrainuniv.edu.iq
Peer Reviewer Name	N.A	**e-mail**	
Review Committee Approval		**Version Number**	

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 Aims أهداف المادة الدراسية	**1.** Teaching the students the principles of Mathematical Physics**.** **2.** Give the Students the ability and experience to solve and discuss the problems related with Mathematical Physics. **3.** Make a connection between the theoretical principles and the experimental applications**.**		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enabling students to know the basics of mathematical physics. 2. Enabling students to understand the applied aspects of mathematical physics.		
Indicative Contents المحتويات الإرشادية	1. Teaching the student the basic concepts of mathematical physics. 2. Providing the student with the skills of discussing and solving applied problems related to mathematical physics. 3. Linking theoretical concepts with practical applications.		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	1. Discussing the topics of the methodological book and auxiliary references. 2. Theoretical lectures including problem solving and discussion of homework 3. Asking students for a set of thinking questions during lectures on specific topics. 4. Giving students homework that requires finding solutions on their own.		

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/ Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	All
	Assignments & H.W.	1	10% (10)	2, 12	All
	Projects / Lab.	0	0%		
	Discussing During Lectures	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	2 hr	20% (20)	9,13	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction** **Special functions:** **The Factorial Function**
Week 2	**Gamma Function**
Week 3	**The Gamma function of negative number**
Week 4	**Some important formulas involving Gamma Function**
Week 5	**Solutions of some Examples**
Week 6	**Beta Function**
Week 7	**Other forms of Beta Function**
Week 8	**The Relation between Gamma and Beta functions**

Week 9	**Test #1**
Week 10	**The Error function**
Week 11	**Series: Solutions of Differential Equations**
Week 12	**Legendre's Equation**
Week 13	**Test #2**
Week 14	**Summary**
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	✓ Mathematical Methods in the Physical Sciences" By: Mary L. Boas, 3rd Edition, 2006.	https://www.christs.cam.ac.uk/sites/default/files/inline-files/0a187866618ca3049030ec5014860ae8-original.pdf
Recommended Texts	**Advanced Calculus**, 3rd Edition, Angus E. Taylor, and W. Robert Mann, 1983.	Available
Websites	Any website related with mathematical physics	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Inorganic Chemistry			**Module Delivery**	
Module Type	SUPLEMENT			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code	CRINOCHE				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	2		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Talib Hamid Mawat		**e-mail**	Dr.talib_h@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor	Talib Hamid Mawat		**e-mail**	Dr.talib_h@nahrainuniv.edu.iq	
Module Reviewer	Talib Hamid Mawat		**e-mail**	Dr.talib_h@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 Aims أهداف المادة الدراسية	1. Overview of the Periodic Table and Atomic Structure 2. Atomic Energy Levels and Electron Orbitals 3. Groups 1 and 2: Alkali Metals and Alkaline Earth Metals 4. Atoms, Molecules, Ions, and Ionic Compounds 5. Periodic Trends: Ionization Energy, Atomic Radius, Electron Affinity, and Electronegativity 6. Chemical Bonding and Physical Properties: Shielding Effect, Dipole Moment, Polarity, Hydrogen Bonding, Melting Point, Boiling Point, Solubility, and Orbital Hybridization
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Introduce students to the fundamental principles of chemistry. 2. Explain atomic structure and the formation of chemical compounds. 3. Explore key chemical phenomena and their underlying concepts. 4. Examine the properties and behaviors of selected chemical elements. 5. Develop practical and laboratory skills through hands-on experiments. 6. Enhance critical thinking and analytical skills to deepen students' understanding of chemistry. 7. Foster productive scientific skills such as observation, interpretation, and problem-solving.
Indicative Contents المحتويات الإرشادية	Indicative Content Includes the Following: 1. Key areas and branches of inorganic chemistry. 2. The modern role and applications of inorganic chemistry in science and industry. 3. Developing students' understanding of how to handle chemicals responsibly and recognize their practical uses. 4. Educating students about hazardous chemicals in the laboratory and teaching essential safety measures to minimize risk.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning strategy is based on the following approaches: 1. Interactive in-class lectures supplemented with educational videos to enhance understanding. 2. Hands-on laboratory sessions to reinforce practical skills and theoretical concepts. 3. Encouraging active student participation through guided questions and group discussions as a core teaching method. 4. Utilizing PowerPoint presentations, along with examples from textbooks and credible online resources, to support learning.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	31	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	5% (5)	Continuous	All
	Lab	1	15% (15)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	4hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Atomic Structure.
Week 2	Atomic Structure.
Week 3	Energy levels, orbitals, Groups 1 & 2, the Alkali Metals and the Alkaline Earth metals.
Week 4	Energy levels, orbitals, Groups 1 & 2, the Alkali Metals and the Alkaline Earth metals.
Week 5	Energy levels, orbitals, Groups 1 & 2, the Alkali Metals and the Alkaline Earth metals.
Week 6	Atoms, Molecules, Ions and ionic compounds.
Week 7	Atoms, Molecules, Ions and ionic compounds.
Week 8	Atoms, Molecules, Ions and ionic compounds.
Week 9	Ionization energy, Atomic Radii, Electron Affinity, electronegativity.

Week 10	Ionization energy, Atomic Radii, Electron Affinity, electronegativity.
Week 11	Shielding effect, Dipole moment, Polarity, Hydrogen bonding, Melting point, Boiling point Solubility Orbital hybridization.
Week 12	Shielding effect, Dipole moment, Polarity, Hydrogen bonding, Melting point, Boiling point Solubility Orbital hybridization.
Week 13	Shielding effect, Dipole moment, Polarity, Hydrogen bonding, Melting point, Boiling point Solubility Orbital hybridization.
Week 14	Mid Exam
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Laboratory Report.
Week 2	Lab 2: Laboratory safety practices.
Week 3	Lab 3: Glasses and laboratory equipement.
Week 4	Lab 4: Preparation of sodium hydroxide
Week 5	Lab 5: Purification of table salt.
Week 6	Lab 6: Preparation and reaction of barium peroxide.
Week 7	Lab 7: Calculate the percentage of water in hydrated salt.
Week 8	Lab 8: Paper chromatography.
Week 9	Lab 9: Synthesis of alum from aluminum.
Week 10	Lab 10: Halogens (Group VII B).
Week 11	Lab 11: Preparation of Calcium Peroxide CaO2.
Week 12	Lab 12: Preparation of Copper Iodate and Determination of Its Solubility Product in Water.
Week 13	Lab 13: Identification of Oxalate in their Complex as Below.
Week 14	Mid Exam
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Inorganic chemistry, Sharpe, A. G. (Alan George), Harlow: Longman Scientific and Technical, 3rd Edition 1992	YES
Recommended Texts	Basic Inorganic Chemistry F. Albert Cotton, Geoffrey Wilkinson, Paul L. Gaus, , 3rd Edition, 1995	YES
Websites	https://courses.lumenlearning.com/boundless-chemistry/chapter/the-structure-of-the-atom/ https://www.acs.org/content/acs/en/careers/chemical-sciences/areas/inorganic-chemistry.html https://courses.lumenlearning.com/boundless-chemistry/chapter/periodic-trends/	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

NB 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.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	وزارة التعليم العالي و البحث العلمي – العراق جامعة النهرين كلية العلوم قسم الفيزياء الطبية	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	CRIMES OF BAATH REGIME IN IRAQ			**Module Delivery**	
Module Type	BASIC			☐**Theory** ☒**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	URBRC				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level	2		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Omar adnan		**e-mail**	omar.adnan@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Master's Degree	
Module Tutor			**e-mail**		
Module Reviewer			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 Aims أهداف المادة الدراسية	1. Introducing students to concepts and definitions related to the crimes of the Baath regime committed during its rule over Iraq. 2. Familiarizing university students with the reality of life over decades experienced by Iraq during the period of Baath regime rule. 3. Increasing students' awareness of the facts without being influenced by any media cover-up of the crimes of the Baath regime in Iraq. The course on the Crimes of the Baath Regime in Iraq is an important and essential subject for students, as it introduces them to the events, circumstances, and violations that Iraq experienced during the Baath regime's rule from 1968 to 2003. The course also explains to students the impact of the Baath regime's policies and actions on Iraqi society.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• That the student recognizes the seriousness of crimes in general. • That the student understands the extent of the injustice of the former regime. • That the student comprehends the scope of the crimes and their legal consequences.
Indicative Contents المحتويات الإرشادية	Raising students' awareness about crimes through history, in Islamic Sharia, and from a legal perspective, in a detailed manner, including their consequences.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Primarily: discussion and mutual dialogue between the instructor and the students. • Continuously presenting documentaries to facilitate understanding. • Preparing brief worksheets by groups selected on a weekly basis.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem)	50		

الحمل الدراسي الكلي للطالب خلال الفصل	

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	Midterm Exam	2 hr	10% (10)	5	LO # 1-4
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	General and foundational introduction to the topic / Crimes of the Baath Regime according to the Iraqi High Criminal Court Law of 2005.
Week 2	Psychological and social crimes, their impacts, and the most prominent violations of the Baathist regime in Iraq.
Week 3	The Baath regime’s stance on religion.
Week 4	Locations of prisons and detention centers under the Baath regime.
Week 5	Midterm exam.
Week 6	Environmental crimes of the Baath regime in Iraq.
Week 7	Draining of the marshlands.
Week 8	Crimes related to mass graves.
Week 9	A discussion session for students to assess their engagement during the lecture.
Week 10	Events related to the mass extermination graves committed by the Baath regime in Iraq.
Week 11	Discussion of reports assigned to students as coursework within the scope of the subject.

Week 12	Chronological classification of mass extermination graves in Iraq from 1963 to 2003.
Week 13	Conducting an extensive discussion of the course material and addressing the main obstacles faced by the students.
Week 14	The week dedicated to review before the final exam.
Week 15	Final exam.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• Ayman Abdel Aziz Salama, *International Responsibility for Committing the Crime of Genocide*, 1st ed., Dar Al-Osoum Publishing and Distribution, Cairo, 2006. • Raed Abis, Dr. Abbas Atiya Al-Quraishi, *United Nations Reports Condemning the Baath Regime for Human Rights Violations (1991–2003)*, Publisher: Iraqi Center for Documenting Extremism Crimes, 1st ed., Dar Al-Kafeel Printing, Karbala, 2023.	yes
Recommended Texts	• Hassan Al-Khayyat, *Geography of the Marshes and Swamps of Southern Iraq*, Al-Alamiya Press, Cairo, 1975. • Abbas Atiya Al-Quraishi, Raed Abis, Hussein Ali Atwan,	yes

	Documentary Encyclopedia of Open Mass Graves in Iraq from 1963–2003, Publisher: Iraqi Center for Documenting Extremism Crimes, 1st ed., Dar Al-Kafeel Printing, Karbala, 2003. .	
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

First course

Semester Five

Level Three

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Cell and Tissue Biology			**Module Delivery**	
Module Type	C			**Theory** *** Lecture** *** Lab** **Tutorial** **Practical** *** Seminar**	
Module Code	MPHY3101				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		3101	**Semester of Delivery**		2
Administering Department		1	**College**	8	
Module Leader	Maytham Abdulkahdim dragh Zainab Ali		**e-mail**	maytham.abdulkahdim@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Master:Zainab Ali	**Module Leader's Qualification**		
Module Tutor	Non		**e-mail**		
Peer Reviewer Name		Non	**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Provide students with fundamental knowledge of cell structure, function, and molecular organization. 2. Develop an understanding of the structural and functional characteristics of the four basic tissue types: epithelial, connective, muscular, and nervous tissues. 3. Enable students to correlate normal cell and tissue structures with their physiological roles in the human body. 4. Introduce histological techniques and microscopic analysis for the study of cells and tissues. 5. Encourage critical thinking by comparing normal and pathological tissue changes. 6. Prepare students with essential background knowledge for advanced courses in pathology, physiology, and related biomedical sciences.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the structural organization and functions of prokaryotic and eukaryotic cells. 2. Identify cellular organelles and explain their roles in maintaining cell physiology. 3. Differentiate between the four basic tissue types (epithelial, connective, muscular, nervous) based on structure and function. 4. Correlate microscopic features of normal tissues with their physiological roles in the human body. 5. Apply histological techniques and use light microscopy to examine cells and tissues. 6. Compare normal and pathological alterations in selected tissues. 7. Demonstrate scientific communication skills in reporting observations and interpretations. 8. Integrate knowledge of cell and tissue biology as a foundation for advanced courses in pathology and biomedical sciences.
Indicative Contents المحتويات الإرشادية	Describe the structural organization and functions of prokaryotic and eukaryotic cells. Identify cellular organelles and explain their roles in maintaining cell physiology. Differentiate between the four basic tissue types (epithelial, connective, muscular, nervous) based on structure and function. Correlate microscopic features of normal tissues with their physiological roles in the human body. Apply histological techniques and use light microscopy to examine cells and tissues. Compare normal and pathological alterations in selected tissues. Demonstrate scientific communication skills in reporting observations and interpretations.

	Integrate knowledge of cell and tissue biology as a foundation for advanced courses in pathology and biomedical sciences.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The **assessment strategy** comprises of summative and formative assessments. Summative assessments are used to generate a final module mark for each student whereas formative assessments are used as a tool for students to assess their own learning and understanding of the module material. As such, completion of formative assessments does not count towards the final module mark. The **summative assessment** for this module is designed to provide students with the opportunity to demonstrate their knowledge of the principles of cell biology by correctly answering multiple choice style questions. In addition, students will be able to demonstrate their practical, analytical and cognitive skills within the practical assessment.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem.) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem.) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10(20%)	3,8	1-5, 8-13
	Assignments	1	5(5%)		6,12
	Projects / Lab.	1	10(10%)		
	Report	1	5(5%)		1-8
Summative assessment	**Midterm Exam**	1	10(10%)		1
	Final Exam	1	50(50%)		1-15
Total assessment			100(100%)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Cell Biology • **Contents**: Definition of the cell, cell theory, classification (prokaryotic vs. eukaryotic), introduction to cellular structural organization. • **Physical focus**: Length scales in biology (from meters to nanometers); importance of cellular scale in medical imaging.
Week 2	Chemical Foundations of Cellular Life • **Contents:** Overview of biomolecules: proteins, carbohydrates, lipids, nucleic acids. • **Physical focus:** Physicochemical properties of biomolecules (charge, polarity, mass) and their role in techniques such as electrophoresis and centrifugation.
Week 3	Structure and Function of the Cell Membrane • **Contents:** Fluid mosaic model, membrane proteins, membrane transport (passive and active). • **Physical focus:** Electrical properties of membranes (membrane potential), diffusion principles, physical basis of osmosis and diffusion, introduction to patch-clamp techniques.
Week 4	The Cytoskeleton • **Contents:** Major components (actin filaments, microtubules, intermediate filaments) and their role in motility, shape, and cell division. • **Physical focus:** Mechanical properties of the cell (elasticity, viscosity, tension); how diseases affect these properties; applications in biomechanics.
Week 5	Cellular Energy and Metabolism • **Contents:** Mitochondria, cellular respiration, ATP. • **Physical focus:** Energy conversion (efficiency of chemical energy conversion), entropy in living systems, metabolic imaging (e.g., PET scan).
Week 6	The Nucleus and Gene Expression • **Contents:** DNA structure, transcription, translation, cell division (mitosis and meiosis). • **Physical focus:** Physical forces within the nucleus, DNA damage by radiation (basis of radiotherapy).
Week 7	Cell Signaling • **Contents:** Types of signaling (direct, paracrine, endocrine), receptors, intracellular pathways. • **Physical focus:** Dynamics of chemical signal diffusion, mathematical modeling of signaling cascades.
Week 8	Midterm Exam + Review
Week 9	Introduction to Histology • **Contents:** Definition of tissue, four major tissue types (epithelial, connective, muscle, nervous), slide preparation techniques (fixation, sectioning, staining). • **Physical focus:** Basics of light absorption in histological staining; introduction to light and electron microscopy.
Week 10	Epithelial Tissue • **Contents:** Classification (by shape and layers), functions (protection, absorption,

	secretion). • **Physical focus:** Barrier properties of epithelial tissues, electrical conductivity across epithelial layers.
Week 11	Connective Tissue • **Contents:** Components (cells, fibers, ground substance), types (proper connective tissue, cartilage, bone, blood). • **Physical focus:** Mechanical properties of bone and cartilage (stiffness, elasticity); applications in radiology and bone imaging; rheological properties of blood (viscosity).
Week 12	Muscle Tissue • **Contents:** Types of muscle tissues (skeletal, smooth, cardiac), mechanism of contraction. • **Physical focus:** Physics of muscle contraction (force, tension), muscle electrical signals (EMG), thermal imaging of muscles.
Week 13	Nervous Tissue • **Contents:** Neurons, glial cells, action potentials, synapses. • **Physical focus:** Physics of neural signal conduction (electromagnetics); techniques for measuring neural activity (EEG, MEG); principles of electrical nerve stimulation.
Week 14	Special Tissues and Applications in Medical Physics • **Contents:** Overview of specialized tissues and their integration into organ systems. • **Physical focus:** Applications of biophysics and medical physics in tissue imaging, diagnostics, and therapeutic techniques.
Week 15	**Review**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Cell and Tissue Laboratory • Familiarization with laboratory safety instructions. • Introduction to the light microscope and its components. • Basic preparation and examination of slides.
Week 2	The Cell under the Microscope • Observation of plant cells (onion) and animal cells (white blood cells and buccal cells). • Comparison between prokaryotic and eukaryotic cells.
Week 3	Basic Cell Staining Techniques • Staining cells with simple dyes (e.g., methylene blue, iodine). • Differentiating between nucleus and cytoplasm.
Week 4	Cell Membrane and Permeability • Demonstration of diffusion and osmosis using plant cells (leaves or potato tubers). • Correlating results with the physical properties of the membrane.
Week 5	Cellular Organelles • Observation of mitochondria/nucleus using specific dyes (e.g., Janus Green). • Practical demonstration of the role of organelles in cellular energy.
Week 6	Cell Division (Mitosis/Meiosis) • Examination of prepared onion root tip slides. • Identification of different stages of cell division under the microscope.
Week 7	Epithelial Tissue

	• Preparation and observation of epithelial tissues (squamous, cuboidal, columnar). • Correlation between structure and function.
Week 8	Midterm Practical Exam
Week 9	Connective Tissue • Observation of connective tissue slides: cartilage, bone, blood. • Study of physical properties (elasticity, rigidity).
Week 10	Muscle Tissue • Observation of muscle tissue types (skeletal, smooth, cardiac). • Comparative study of structure and function.
Week 11	Nervous Tissue • Identification of neurons and glial cells. • Observation of axons and cell bodies using special stains.
Week 12	Advanced Microscopy Techniques • Examination of electron microscopy images (TEM, SEM). • Linking microscopic images to physical properties and medical diagnosis.
Week 13	Comprehensive Review • Revision of all studied slides and tissues. • Discussion of medical and physical applications.
Week 14	Final Practical Exam
Week 15	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts		Online
Recommended Texts		Online
Websites		

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.

Ministry of Higher Education and Scientific Research - Iraq
Al-Nahrain University
College of Science
Department of Medical Physics

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Health Physics			**Module Delivery**	
Module Type	S			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	REQ1217				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Medical Physics Sciences Department		**College**	College of Science	
Module Leader	Dr. Ibrahim Karim Abbas		**e-mail**	Ibrahim.karim@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Module Reviewer			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		
Lab. Staff.					

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 Aims أهداف المادة الدراسية	The main objectives of this course are to provide students with the foundational scientific principles that connect physics with its applications in health and medicine. These six key objectives are: • To understand the relationship between fundamental physics concepts and their applications in the medical and health fields. • To identify the types of ionizing and non-ionizing radiation and their effects on biological tissues. • To acquire the necessary knowledge about diagnostic and therapeutic medical devices based on physical principles, such as X-ray imaging, MRI, and ultrasound. • To apply radiation protection principles to ensure the safety of patients and staff in healthcare facilities. • To understand fluid physics and its applications in blood circulation, as well as the physics of sound and its uses in medical ultrasound. • To learn about radiation therapy techniques used in cancer treatment and how to calculate radiation doses.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- **Analyze and interpret** the physical principles behind the operation of major medical devices. - **Evaluate** the health risks associated with exposure to different types of radiation and **apply** appropriate protective measures. - **Connect** physics concepts to health-related problems, providing them with a solid foundation for working in a medical or healthcare environment.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - **Focus on Practical Applications:** Theoretical concepts are presented with practical examples from real-world medical scenarios to highlight their importance. - **Use of Diagrams and Illustrations:** To simplify complex concepts related to the physics of medical devices and the effects of radiation. - **Exercises and Applied Problems:** Students are provided with exercises to solve computational problems related to radiation doses, device efficiency, and fluid mechanics. - **Participation in Discussions:** Students are encouraged to ask questions and discuss modern developments in medical devices and radiation therapy.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning strategies for this course blend theory and practice to foster deep understanding. They include Problem-Based Learning, where real medical cases are used to apply physical principles, and Collaborative Learning, which

	encourages students to work together in groups. The course also integrates Simulation-Based Learning using specialized software to mimic medical devices and radiation physics, alongside Self-Directed Learning that allows students to explore topics of personal interest.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	32	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	Continuous	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	Continuous	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	Continuous	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Health Physics and the Role of the Medical Physicist
Week 2	Ionizing Radiation: Types, Properties, and Interactions with Matter
Week 3	Fundamentals of Dosimetry
Week 4	Radiation Detection Instruments: Principles and Applications
Week 5	Radiation Protection: Principles and Regulations
Week 6	Diagnostic Medical Imaging with X-rays

Week 7	Computed Tomography (CT) Scanning: Principles and Applications
Week 8	**Mid exam**
Week 9	Nuclear Medicine and Positron Emission Tomography (PET) Scanning
Week 10	Magnetic Resonance Imaging (MRI): Physical Principles and Applications
Week 11	Ultrasound Imaging
Week 12	Radiation Therapy: Principles and Techniques
Week 13	Laser Physics and its Applications in Medicine
Week 14	Radioactive Waste Management and Radiological Emergencies
Week 15	**final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	
Week 2-3	
Week 3-4	
Week 4-5	
Week 5-6	
Week 6-7	
Week 7-8	
Week 8-9	
Week 9-10	
Week 10-11	
Week 11-12	
Week 12-13	
Week 13-14	
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Introduction to Health Physics, Fourth Edition, Herman Cember and Thomas E. Johnson. 2009.	No (Available as an e-book)
Recommended Texts	Introduction to Health Physics: Fourth Edition, Parham Alaei. 2008.	No (Available as an e-book)
Websites		

APPENDIX:

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.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

Ministry of Higher Education and Scientific Research - Iraq
Al-Nahrain University
College of Science
Department of Medical Physics

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Image processing			**Module Delivery**	
Module Type	Core			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	MPHY3102				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	5		**Semester of Delivery**	2	
Administering Department	Medical Physics Sciences Department		**College**	College of Science	
Module Leader	Dr. Salam E Hammeed		**e-mail**	Salam.dulaimi@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Intizar Malik		**e-mail**		
Module Reviewer			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		
Lab. Staff.					

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 Aims

أهداف المادة الدراسية

General Aims of an Image Processing Module

The primary goal of an image processing module is to equip learners with the foundational knowledge, skills, and tools to work with digital images in practical, real-world scenarios. This field bridges theory (e.g., mathematics and signal processing) with applications (e.g., in AI, medical imaging, and computer vision). Key overarching aims include:

1. **Building Theoretical Foundations**: To provide a deep understanding of how images are represented, processed, and analyzed digitally. This helps learners grasp the "why" behind techniques, rather than just the "how."
2. **Developing Practical Skills**: To enable students to implement image processing algorithms using programming tools (e.g., Python with libraries like OpenCV or MATLAB). The aim is to foster hands-on problem-solving for tasks like image enhancement or feature extraction.
3. **Fostering Interdisciplinary Applications**: To connect image processing to real-world domains such as healthcare, robotics, entertainment, and security, encouraging learners to apply concepts innovatively.
4. **Promoting Ethical and Critical Thinking**: To discuss the societal implications of image processing (e.g., privacy concerns in facial recognition or biases in AI-driven image analysis), aiming to produce responsible practitioners.
5. **Preparing for Advanced Studies or Careers**: To lay the groundwork for related fields like computer vision, machine learning, or data science, with aims to prepare students for research, industry roles (e.g., software engineer in imaging tech), or further education.

Module Learning Outcomes

مخرجات التعلم للمادة الدراسية

Knowledge-Based Learning Outcomes

These focus on foundational concepts and theories.

- **Describe Image Representation and Acquisition**: Students will be able to explain how digital images are formed, represented (e.g., as matrices of pixels in RGB, grayscale, or other color spaces), and acquired (e.g., via sensors, cameras, or scanners), including common file formats and their properties.
- **Understand Core Processing Domains**: Students will be able to differentiate between spatial domain techniques (e.g., convolution for filtering) and frequency domain methods (e.g., Discrete Fourier Transform for spectral analysis), and articulate their advantages and limitations.
- **Explain Image Enhancement and Restoration Principles**: Students will be able to define techniques like histogram equalization, noise models (e.g., Gaussian or salt-and-pepper), and restoration methods (e.g., inverse filtering), including mathematical foundations.

Skill-Based Learning Outcomes

These emphasize hands-on implementation and technical proficiency.

- **Implement Basic Image Operations**: Students will be able to apply point processing (e.g., brightness/contrast adjustment) and neighborhood operations (e.g., edge detection using Sobel or Prewitt operators) using programming tools like Python (with OpenCV or scikit-image) or MATLAB.
- **Perform Image Analysis Tasks**: Students will be able to execute segmentation (e.g., thresholding, k-means clustering) and morphological operations (e.g., erosion, dilation, opening/closing) to extract features like

	shapes, textures, or boundaries from images. • **Evaluate Image Processing Results**: Students will be able to assess algorithm performance using quantitative metrics such as Mean Squared Error (MSE), Peak Signal-to-Noise Ratio (PSNR), or Structural Similarity Index (SSIM), and interpret qualitative outcomes (e.g., visual improvements). **Application-Based Learning Outcomes** These connect theory to real-world scenarios and problem-solving. • **Apply Techniques to Domain-Specific Problems**: Students will be able to solve practical challenges, such as enhancing low-light images for photography, compressing images for storage (e.g., using JPEG principles or wavelets), or detecting objects in medical scans (e.g., tumor segmentation in MRI images). • **Integrate with Related Technologies**: Students will be able to combine image processing with elements of computer vision or machine learning, such as using convolutional filters for feature extraction in preparation for neural network-based tasks like object recognition. • **Develop and Test Custom Solutions**: Through projects, students will be able to design, implement, and debug an end-to-end image processing pipeline (e.g., a system for license plate recognition or facial feature enhancement), demonstrating creativity and optimization for efficiency. **Professional/Ethical Learning Outcomes** These promote responsible practice and critical thinking. • **Analyze Ethical Implications**: Students will be able to discuss societal impacts of image processing, such as privacy risks in surveillance systems, biases in automated facial recognition, or ethical considerations in image manipulation (e.g., deepfakes). • **Communicate Findings Effectively**: Students will be able to present technical results (e.g., via reports, visualizations, or presentations) to both technical and non-technical audiences, including recommendations for improvements or alternatives. • **Engage in Lifelong Learning**: Students will be able to identify gaps in their knowledge and suggest resources (e.g., research papers or advanced tools) for further exploration in emerging areas like AI-driven image synthesis or 3D processing. **Assessment and Achievement** Learning outcomes are typically evaluated through a mix of methods: • **Exams/Quizzes**: Testing theoretical knowledge. • **Labs/Assignments**: Hands-on coding tasks. • **Projects**: Group or individual work, such as building an image filter app. • **Presentations**: Demonstrating applications and ethical discussions.
Indicative Contents المحتويات الإرشادية	**Overall Module Structure** • **Duration**: 10-12 weeks. • **Prerequisites**: Basic programming (e.g., Python or MATLAB), linear algebra, and calculus. • **Teaching Methods**: Lectures, tutorials, hands-on labs, group projects, and guest talks on applications. • **Assessment**: Midterm exam (20%), labs/assignments (30%), final project (30%), final exam (20%). • **Tools**: Python (with libraries like OpenCV, scikit-image, NumPy),

MATLAB, or ImageJ for practical work.

- **Textbooks/Readings**: "Digital Image Processing" by Gonzalez and Woods; "Computer Vision: Algorithms and Applications" by Szeliski; research papers from IEEE journals.

Week-by-Week Indicative Contents

I'll break this down by week, grouping related topics. Each week includes key subtopics, learning activities, and suggested readings.

Weeks 1-2: Introduction to Digital Images and Fundamentals

- **Core Topics**:
  - Image formation and acquisition: Sensors, cameras, digitization processes, and sampling/quantization (e.g., Nyquist theorem).
  - Image representation: Pixels, matrices, color models (RGB, CMYK, HSV, grayscale), bit depth, and file formats (JPEG, PNG, TIFF).
  - Basic operations: Image arithmetic (addition, subtraction), geometric transformations (scaling, rotation, warping).
- **Activities**: Lecture on image basics; lab: Load and display images using Python/OpenCV, perform simple transformations.
- **Readings**: Gonzalez & Woods, Chapters 1-2.
- **Objectives Tie-In**: Builds foundational knowledge for representation and basic manipulation.

Weeks 3-4: Image Enhancement in the Spatial Domain

- **Core Topics**:
  - Point processing: Intensity transformations (e.g., negation, logarithmic/gamma correction).
  - Histogram processing: Equalization, matching, and specification for contrast enhancement.
  - Spatial filtering: Smoothing (averaging, median filters) for noise reduction; sharpening (Laplacian, high-boost filters).
  - Noise models: Gaussian, salt-and-pepper, speckle noise, and basic denoising techniques.
- **Activities**: Tutorial on histograms; lab: Implement histogram equalization and apply filters to noisy images. Assignment: Enhance a low-contrast photo.
- **Readings**: Gonzalez & Woods, Chapters 3-4.
- **Objectives Tie-In**: Develops skills in enhancement and evaluation metrics (e.g., PSNR).

Weeks 5-6: Frequency Domain Processing and Restoration

- **Core Topics**:
  - Fourier transforms: Discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), and frequency domain filtering.
  - Low-pass/high-pass filters: Ideal, Butterworth, Gaussian filters for blurring or edge enhancement.
  - Image restoration: Inverse filtering, Wiener filtering for deblurring, and handling degradation models (e.g., motion blur).
  - Wavelets: Introduction to wavelet transforms for multi-resolution analysis.
- **Activities**: Lecture with mathematical derivations; lab: Apply FFT to images and filter in frequency domain using Python (e.g., with NumPy.fft).
- **Readings**: Gonzalez & Woods, Chapters 4-5; optional: Mallat's "A Wavelet Tour of Signal Processing."
- **Objectives Tie-In**: Covers advanced analysis in frequency domains, with implementation practice.

Weeks 7-8: Image Segmentation and Morphological Processing

- **Core Topics**:
  - Segmentation techniques: Thresholding (global, adaptive, Otsu's method), edge-based (Sobel, Canny operators), region-based (growing, splitting/merging).

	○ Morphological operations: Erosion, dilation, opening, closing, and skeletonization for shape analysis. ○ Feature extraction: Contours, textures, moments (e.g., Hu moments for invariance). ○ Watershed algorithm and graph-based segmentation. • **Activities**: Case study on object detection; lab: Segment medical images (e.g., cells in microscopy) and apply morphology to binary images. • **Readings**: Gonzalez & Woods, Chapters 9-10. • **Objectives Tie-In**: Focuses on analysis tasks like isolating regions, with ethical discussions on applications (e.g., in surveillance). **Weeks 9-10: Color Image Processing and Compression** • **Core Topics**: ○ Color models and transformations: RGB to HSV/YCbCr, pseudocolor processing. ○ Color enhancement and balancing: White balance, color correction. ○ Image compression: Lossless (Huffman coding, run-length encoding) vs. lossy (JPEG pipeline, DCT-based compression); introduction to standards like JPEG2000. ○ Advanced topics: Multi-spectral imaging or basic video processing extensions. • **Activities**: Group discussion on compression trade-offs; lab: Implement a simple JPEG-like compressor and compare file sizes/quality. • **Readings**: Gonzalez & Woods, Chapters 6 and 8. • **Objectives Tie-In**: Integrates color theory with practical compression, preparing for real-world data handling. **Weeks 11-12: Applications, Integration, and Emerging Topics** • **Core Topics**: ○ Real-world applications: Medical imaging (e.g., MRI enhancement), remote sensing (satellite imagery), computer vision (object detection), biometrics (facial recognition). ○ Integration with AI/ML: Convolutional Neural Networks (CNNs) for image processing tasks; brief intro to deep learning libraries like TensorFlow. ○ Ethical considerations: Bias in algorithms, privacy issues, deepfakes, and responsible AI practices. ○ Emerging trends: 3D image processing, hyperspectral imaging, or AI-generated images (e.g., GANs). • **Activities**: Guest lecture from industry (e.g., on autonomous vehicles); final project: Develop an end-to-end application (e.g., automated defect detection in manufacturing). Review and exam prep. • **Readings**: Szeliski, Chapter 1; selected papers on ethics (e.g., from ACM or IEEE). • **Objectives Tie-In**: Encourages application-based problem-solving and professional awareness.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching strategies • **Hands-on and project-based learning:** ○ Provide ample opportunities for students to write code by implementing algorithms from scratch, which reinforces

concepts better than passive learning.

- Assign projects that require students to solve real-world problems, such as medical image analysis or applications in robotics.

- **Collaborative learning:**
  - Encourage pair programming where one student writes code and the other acts as a navigator, promoting problem-solving and communication skills.
  - Foster a culture of continuous improvement through peer-to-peer code reviews.
- **Practical application of theory:**
  - Demonstrate both fundamental concepts and advanced topics, from basic image filtering and compression to deep learning architectures like convolutional neural networks.
  - Use practical examples and case studies to show how the theory applies to real-world applications, such as medical imaging, video compression, or autonomous vehicles.
- **Structured curriculum:**
  - Start with foundational topics like image acquisition, filters, and compression before moving to higher-level subjects like object detection, segmentation, and deep learning.
  - Integrate mathematical skills needed to solve problems within the image processing context.
- **Clear and constructive feedback:**
  - Provide regular and constructive feedback on students' code to guide them in improving their programming skills.

Learning strategies

- **Active coding:**
  - Students should actively write code to implement and test algorithms to develop a direct understanding of how they work.
- **Problem-solving:**
  - Engage with the material by applying learned techniques to new problems and synthesizing the results.
- **Collaboration:**
  - Work with peers on assignments to discuss and solve

	problems together.
	• **Self-study:**
	  ○ Allocate time for independent study, wider reading, and practice to reinforce what is learned in lectures and labs.
	• **Effective communication:**
	  ○ Practice writing accurate lab reports and effectively communicating findings.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	62	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	63	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	Continuous	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	Continuous	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	Continuous	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Back ground

Week 2	Digital image fundamentals An image model Uniform and non-uniform image sampling and quantization Basic relationship between pixel (neighbours of pixel) Connectivity distance measures
Week 3	Image transforms Introduction to Fourier transform The discrete Fourier transforms Some properties of two-dimensional Fourier transform Separability, Translation, Rotation, Scaling, Average, value, Convolution, Correlation, Sampling
Week 4	Translation, Rotation, Scaling, Average, value, Convolution, Correlation, Sampling
Week 5	Fast Fourier transform FFT algorithm The inverse FFT
Week 6	Walsh transform Hadamard transform Discrete cosine transform Hotelling transform
Week 7	Discrete cosine transform Hotelling transform
Week 8	**Mid exam**
Week 9	Examination
Week 10	Image enhancement Spatial domain method
Week 11	Frequency domain method
Week 12	Image smoothing Linear averaging Median filtering Low pass filtering Averaging of multiple images
Week 13	Image sharpening Sharpening by differentiation High pass filtering Butterworth high pass filter
Week 14	Gaussian high pass filter The Laplacian in frequency domain
Week 15	**final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	
Week 2-3	
Week 3-4	
Week 4-5	
Week 5-6	
Week 6-7	
Week 7-8	
Week 8-9	
Week 9-10	
Week 10-11	

Week 11-12	
Week 12-13	
Week 13-14	
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		No (Available as an e-book)
Recommended Texts		No (Available as an e-book)
Websites		

APPENDIX:

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
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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	LASER	**Module Delivery**	
Module Type	CORE		☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☐**Practical** ☐**Seminar**
Module Code			
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	**Semester of Delivery**	1
Administering Department	MPHY	**College**	College of Science
Module Leader	Dr. Alaa Jabbar Ghazai	**e-mail**	dr.alaa.ghazai@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	PhD
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Review Committee Approval	16/9/2025	**Version Number**	1.0
Laboratory staff	Dr.Ibrahim karim Abbas, Dr.Saif Mohsim,Dr.zaid malk,MSc.Marwa Ahmed,MSc.raghda Harith		

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 Aims أهداف المادة الدراسية	1. Teaching the student the science principles of laser. 2. Familiarity with laser light phenomena and application areas. 3. Learn about real-life practical applications of laser.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student can learn about the introduction to lasers, in addition to the basic concepts of lasers and Einstein's relations. 2. The student can understand the common features of different laser modes. 3. The student can explain the properties of laser radiation, optical feedback, and laser oscillation. 4. The student will explain the dual laser and learn about the applications of lasers in various medical, industrial, and scientific fields. 5. Students' ability to apply what has been calculated theoretically in a practical way in the future.
Indicative Contents المحتويات الإرشادية	- Introduction to laser, Basic concepts of lasers, Einstein Relations. [15 hrs.] - Common Features of Lasers, Condition for Light Amplification, Population inversion, Gain coefficient, Optical cavity, Modes of laser cavity. [15 hrs.] - Characteristics of Laser Radiation, Types of lasers: solid-state, dye, and semiconductor lasers [20 hrs.] - Types of lasers: free electron and X-ray lasers Laser diode. Laser Applications: Medical application Industrial application, scientific application. [15 hrs.]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	- Discussing the topics of the curriculum book and supporting references Theoretical lectures including problem solving and discussion of homework. - Asking students a set of thinking questions during the lectures for specific topics. - Giving students homework that requires finding self-solutions.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	135	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2, 5, 10, 12	LO #1, 2, 10 and 11
	Assignments	6	10% (10)	Continuous	All
	Projects / Lab.	7	5% (5)	Continuous	All
	Report	7	10% (10)	Continuous	All
	Seminar	1	5% (5)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	5hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction of laser**
Week 2	**Basic concepts of lasers: Spontaneous and stimulated emission and absorption**
Week 3	**Einstein Relations**
Week 4	**-Common Features of Lasers** **-Condition for Light Amplification**
Week 5	**Population inversion, Gain coefficient, Optical cavity, Modes of laser cavity.**
Week 6	**Characteristics of Laser Radiation**
Week 7	**Optical feedback and laser oscillation**

Week 8	**Types of lasers: solid-state, dye, and semiconductor lasers**
Week 9	**Types of lasers: gas and chemical lasers**
Week 10	**Types of lasers: free electron and X-ray lasers**
Week 11	**Laser diode**
Week 12	**Laser Applications: Medical application**
Week 13	**Laser Applications: Industrial application, scientific application**
Week 14	**Mid Exam**
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1-2	Lab 1: Measurement of Laser Beam Divergence
Week 3-4	Lab 2: Measurement for the Refractive Index of Air by using laser beam
Week 5-6	Lab 3: Measurement of glass bottle thickness by using laser beam
Week 7-8	Lab 4: A-Measurement of distance between the grooves for compact disk B-determine un known Wavelength for laser beam
Week 9-10	Lab 5: Range Finder by using laser beam
Week 11-12	Lab 6: Determination of Minority Carrier Lifetime in P-N Junction.
Week 13	Lab 7: Gaussian Distributions
Week 14	Mid Exam
Week 15	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Laser Physics and Applications, H. Weber, G. Herziger, R. Poprawe, Springer,2005	YES
Recommended Texts	Principles of laser, O. Svelto, Springer, 2010	YES
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
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	F – Fail	راسب	(0-44)	Considerable amount of work required

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	OPTICS			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☐**Seminar**	
Module Code	MPHY3104				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	1	
Administering Department	Medical physics		**College**	College of Science	
Module Leader	Dr. Ahmed H. Flayyih		**e-mail**	ahmed.hmood@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr.sarah abd karim		**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**	1.0	

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	1
Co-requisites module	None	**Semester**	
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	Module aims in optics generally focus on developing a deep understanding of light, its fundamental properties, and how it interacts with matter, including concepts like geometrical optics, physical optics, polarization, interference, and diffraction. They aim to equip students with the ability to apply these principles to solve optical problems, understand the operation of optical instruments, analyze optical systems, and prepare them for advanced study or careers in optics-related fields		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Module learning outcomes for an optics course include the ability to explain and apply principles of geometric optics, such as reflection and refraction, analyze wave phenomena like interference and diffraction, describe the polarization of light, understand the working principles of optical instruments, calculate properties of optical systems, and apply optics concepts to solve problems in various contexts, from everyday phenomena to advanced technologies. .		
Indicative Contents المحتويات الإرشادية	Chapter One: Properties of Light Chapter Two: Mirror , Lenses and prism Chapter Three: Interference Chapter Four: Diffraction		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	The learning strategy depends on the following: 1. Feeding the student with theoretical foundations and concepts from theoretical lectures 2. Daily and semester tests 3. Assigning students to solve the required mathematical problems and discussing them during the class		

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	31	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	15% (15)	3, 6, 8	LO #1,
	Assignments	2	10% (10)	5, 12	LO # 3, 4
	Projects / Lab.	1	15% (15)	Continuous	LO#, 1, 2 AND 3
	Report	-------	----------	-	
Summative assessment	**Midterm Exam**	3 hr	10% (10)	9	LO#,3
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	General Introductions
Week 2	Chapter one: light speed, optical path, refractive index, Laws of Reflection and Refraction,
Week 3	Fermat's Principle, Critical angle and total internal reflection**,** Tutorials
Week 4	Chapter Two: General concept, Focal Point, Real and Virtual Image, Sign Convention
Week 5	Concave Mirror, Mirror Formula, Magnification by Mirror
Week 6	Convex mirror, Tutorials
Week 7	Concave and Convex lenses
Week 8	Chapter3: Interference by Division of Wave Front, INTERFERENCE OF TWO BEAMS OF LIGHT, HUYGENS' PRINCIPLE, YOUNG'S EXPERIMENT, INTERFERENCE FRINGES FROM A DOUBLE SOURCE
Week 9	**Mid-term exam**

Week 10	Other Apparatus Depending on Division of The Wave Front Including
Week 11	Interference by Division of Amplitude including, Michelson Interferometer
Week 12	Chapter4: Fraunhofer Diffraction, The Single-Slit Diffraction
Week 13	The Double-Slit Diffraction, MAXIMA AND MINIMA MISSING ORDERS,
Week 14	THE DIFFRACTION GRATING
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Instructions to students, Basic personal needs and other requirements. Writing the account of an experiment, Introduction to graphical representation of experimental data, Errors, their determination and minimization, least square fitting. Units.
Week 2	Lab1:
Week 3	Lab 2:
Week 4	Lab 3:
Week 5	Lab 4:
Week 6	Lab 5:
Week 7	Lab 6:
Week 8	Lab 7:
Week 9	Lab 8:
Week 10	Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of Optics: 4th Edition/ Shirley Grall Geometrical Optics/ E. R. Huggins/ Dartmouth College	Available
Recommended Texts		Available
Websites	https://pandaveswarcollege.ac.in/wp-content/uploads/2025/01/Fundamentals-of-Optics-4th-Edition.pdf https://www.spiedigitallibrary.org/ebooks/PM/Fundamentals-of-Optics-An-Introductory-Course/1/Fundamentals-of-Optics-An-Introductory-Course-Full-Book/10.1117/3.2660873.sup https://www.routledge.com/Fundamentals-of-the-Optics-of-Materials-Tutorial-and-Problem-Solving/Gavrilenko-Ovechko/p/book/9789814877930?srsltid=AfmBOorZJoVH7m5caW0wgSKYlEIKXGL3mdPPOCObIRficjczRxrjUwV6	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Solid State Physics			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	MPHY3106				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	1	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Marwa Abdul Muhsien		**e-mail**	marwa@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	PhD	
Module Tutor	Zaid Malk Abbas		**e-mail**	zaid.malk@nahrainuniv.edu.iq	
Module Reviewer			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 Aims أهداف المادة الدراسية	1. Provide students with a fundamental understanding of the principles governing the structure and properties of solid materials. 2. Develop the ability to analyze crystal structures, bonding mechanisms, and lattice vibrations, and relate them to physical properties of solids. 3. Introduce the concepts of reciprocal lattice, X-ray diffraction, and band theory, enabling students to interpret the electrical, thermal, and optical behavior of materials. 4. Familiarize students with different classes of materials such as metals, semiconductors, insulators, magnetic, and superconducting materials, highlighting their physical mechanisms. 5. Encourage students to connect solid state physics principles with modern technological applications, such as electronic devices, nanomaterials, and advanced functional materials. 6. Motivate students to engage in independent learning and research in condensed matter physics and its applications in science and engineering
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Analyze the crystal structure of solids and use mathematical methods to describe periodic lattices, unit cells, and reciprocal space. 2. Apply Bragg's law and X-ray diffraction principles to determine crystal structures experimentally. 3. Understand and explain different types of bonding in solids (ionic, covalent, metallic, van der Waals, hydrogen bonding) and their impact on material properties. 4. Interpret the concepts of reciprocal lattice, Miller indices, and crystal planes, and use them in analyzing solid structures. 5. Apply the free electron model, nearly free electron model, and band theory to explain electrical conductivity in metals, semiconductors, and insulators. 6. Explain the concept of density of states, Fermi energy, and carrier concentration, and relate them to thermal and electrical properties of solids.
Indicative Contents المحتويات الإرشادية	**1. Crystal Structure** - Periodic arrays of atoms - Unit cell, basis and lattice parameters - Bravais lattices and crystal systems - Miller indices and crystal planes - Simple crystal structures: SC, BCC, FCC, HCP **2. X-ray Diffraction and Reciprocal Lattice** - Bragg's law - Structure factor and intensity

	- Reciprocal lattice and Ewald construction **3. Crystal Bonding** - Ionic, covalent, metallic, van der Waals, hydrogen bonding - Relation to material properties **4. Lattice Vibrations and Thermal Properties** - Vibrations of monatomic and diatomic lattices - Phonons and quantization of lattice vibrations - Heat capacity: Einstein and Debye models - Thermal conductivity **5. Free Electron and Band Theory** - Free electron model and density of states - Fermi energy and Fermi-Dirac statistics - Nearly free electron model - Origin of energy bands and band gaps - Metals, semiconductors, and insulators **6. Semiconductors and Superconductors** - Intrinsic and extrinsic semiconductors - Carrier concentration and conductivity - Superconductivity: basic properties and applications
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Inquiry-based learning: Encourages students to ask questions and discover concepts on their own through experiments and research projects, which enhances critical thinking and problem-solving skills. 2. Collaborative learning: Encouraging teamwork where students exchange ideas and collaborate in solving scientific questions and experiments. 3. Brainstorming and group discussion: This strategy helps to promote group thinking and the cultural exchange of scientific ideas among students. 4. Problem-based learning: Students learn physics by facing real issues and solving those using physics tools and concepts. 5. Constructive assessment: Using continuous assessment to measure students' progress and understanding of concepts, rather than relying solely on final exams.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2

Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	1.Crystal Structure - Periodic arrays of atoms - Unit cell, basis and lattice parameters
Week 2	Bravais lattices and crystal systems - Miller indices and crystal planes - Simple crystal structures: SC, BCC, FCC, HCP
Week 3	2. X-ray Diffraction and Reciprocal Lattice - Bragg's law
Week 4	Structure factor and intensity - Reciprocal lattice and Ewald construction
Week 5	3.Crystal Bonding - Ionic, covalent bonding
Week 6	Van der Waals, hydrogen bonding - Relation to material properties
Week 7	4. Lattice Vibrations and Thermal Properties - Vibrations of monatomic and diatomic lattice
Week 8	Phonons and quantization of lattice vibrations - Heat capacity: Einstein and Debye models - Thermal conductivity
Week 9	5. Free Electron and Band Theory - Free electron model and density of states
Week 10	Fermi energy and Fermi-Dirac statistics - Nearly free electron model

Week 11	Origin of energy bands and band gaps - Metals, semiconductors, and insulators
Week 12	6. Semiconductors and Superconductors - Intrinsic and extrinsic semiconductors
Week 13	Carrier concentration and conductivity - Superconductivity: basic properties and applications
Week 14	Mid Exam
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Charles Kittel – Introduction to Solid State Physics, 8th Edition, Wiley, 2005.	No
Recommended Texts	Neil W. Ashcroft & N. David Mermin – Solid State Physics, Holt, Rinehart and Winston, 1976.	YES
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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Second course

Semester Two

Level One

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	BIOMECHANICS			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code					
ECTS Credits					
SWL (hr/sem)					
Module Level	1		**Semester of Delivery**	2	
Administering Department	Medical physics		**College**	College of Science	
Module Leader	Dr. Ibrahim Karim Abbas		**e-mail**	Ibrahim.karim@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer Doctor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	2
Co-requisites module	None	**Semester**	
Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Aims أهداف المادة الدراسية	**1. Define the terms *biomechanics, statics, dynamics, kinematics,* and *kinetics,* and explain the ways in which they are related.** **2. Describe the scope of scientific inquiry addressed by biomechanics.** **3. Distinguish between qualitative and quantitative approaches for analyzing human movement, and explain how to formulate questions for qualitative analysis of human movement.**		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**On completion of this module, students are expected to be able to:** **1. Explain the actions of forces and moments and the concept of equilibrium in biomechanics.** **2. Discuss tensile and compressive loading and the associated linear stress-strain relationship in biomechanics.** **3. Discuss the kinematics of simple translation and rotational biomechanical systems, kinetics of rigid bodies and apply the concepts of work, power and energy.** **4. Explain the effects of friction, mass moment of inertia and the dynamics of simple systems in biomechanics.**		
Indicative Contents المحتويات الإرشادية			
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	**The learning strategy depends on the following:** **1- Feeding the student with theoretical foundations and concepts from theoretical lectures.** **2- Daily and semester tests.** **3- Assigning students to solve the required mathematical problems and discussing them during the class.**		

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل			

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	15% (15)	5, 8	LO #1, LO#2
	Seminar	7	10% (5)	2, 4.7	LO # 3, 4
	Projects / Lab.	10	30% (15)	Continuous	LO#, 1, 2 AND 3
	Tutorials	7	5% (5)	-	
Summative assessment	**Midterm Exam**	3 hr	10% (10)	8	LO#1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to Biomechanics**
Week 2	**Static Forces and Equilibrium**
Week 3	**Mechanical Properties of Bone**
Week 4	**Human Levers and Linkage Systems**
Week 5	**Kinematics of Human Movement**
Week 6	**Applications in Biomechanics**
Week 7	**Force Analysis, Friction, and Equilibrium in Biomechanics**
Week 8	**Mid-term exam**
Week 9	**Bio-Fluid Mechanics I: Hemodynamics**
Week 10	**Bio-Fluid Mechanics II: Respiratory Physics**
Week 11	**Work, Power, and Energy Expenditure**
Week 12	**Tutorials and applications in biomechanics**
Week 13	**Physics of Pressure in Biological Systems**

Week 14	**Tutorials and applications in biomechanics**
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Instructions to students, Basic personal needs and other requirements. Writing the account of an experiment, Introduction to graphical representation of experimental data, Errors, their determination and minimization, least square fitting. Units.
Week 2	Lab 2: Force Table
Week 3	Lab 3: Boyle's Law
Week 4	Lab 4: Tension experiment
Week 5	Lab 5: Inclined Plane
Week 6	Lab 6: Free Fall
Week 7	Lab 7: Newton Laws
Week 8	Lab 8: Momentum inertia experiment
Week 9	Lab 9: Arduino Sensors and its applications in Biomechanics
Week 10	Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		Available
Recommended Texts	**Biomechanics of Sport and Exercise Third Edition, 2013 Peter M. McGinnis State University of New York, College at Cortland**	Available
	Fundamentals of Biomechanics Duane Knudson Third Edition, Springer 2021	Available
Websites	**https://z-lib.id/**	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
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Note:

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Ministry of Higher Education and Scientific Research - Iraq
Al-Nahrain University
College of Science
Department of Medical Physics

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	COMPUTER			**Module Delivery**	
Module Type	Basic			☒**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	URCOM				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level		1	**Semester of Delivery**		2
Administering Department		MPHY	**College**	College of Science	
Module Leader	Fatimah Fadhil Abd Ali		**e-mail**	Fatimahfadhil33@nahrainunivm.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Module Reviewer					
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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 Aims أهداف المادة الدراسية	At the end of the course, the students will be able to: • 1- Developing the student to adapt to the rapid changes of special technologies in the field of information that characterizes it age. • 2- Developing the student's ability to think scientifically through the problem-solving method using Computers. • 3- Providing the student with self-learning skills and research and investigation skills through using different computer software applications.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Module 1: Cognitive objectives** -Achieving cognitive communication between students and benefiting from contemporary developments and rapid transmission the information. -Providing students with integrated scientific knowledge in the field of computer science. -To be proficient in preparing scientific research in a manner that takes into account an integrated scientific methodology. -To know the methods of conveying information to practice the teaching profession and balance it with the applied reality Within educational institutions. -Apply the basic and advanced programming skills they have learned to enrich their knowledge Intellectual science in the field of computers and its other applications. -To be proficient in managing the analysis of information systems and databases with high efficiency. -Teaching students the foundations of communications management, computer networks, and operating systems. -Teaching students the skills of designing, supervising and following up on websites. -Teaching the student ways to secure data and computers and finding solutions to allow them to be frozen in everyone Magazines. **Module 2: The skills objectives of the course** **Identify and explain a variety of computer components** • -1 Knowledge skills - remembering • 2-Remembering and analysis skills • 3-Use and development skills **Module 3: Teaching and learning methods** **Lecture method and use of the interactive whiteboard** • Providing students with the basics and additional topics related to thinking outcomes • Asking students questions and forming discussion groups during lectures to discuss the solution to the issues

	• It requires thinking and analysis • Giving students assignments to solve problems • Assigning students to prepare reports related to the course **Module 4: General and qualifying transferable skills (other skills related to employability and development personal)** • -1 Participation in scientific workshops and seminars inside and outside the country • -2 Follow up on scientific development through contacting international universities via the Internet • -3 Developing the student's ability to conduct scientific research and reports
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to computer science: Should be able to show an understanding of the historical evolution from mainframe to tablet. They should also understand differences between these systems, e.g. power, computational characteristics, resources, and should be able to compare them. Introduction to operating systems and system software a. The human interface b. The operating principles and characteristics of printers, display devices, input devices. When you connect a device, the operating system has to perform some tasks in order to be able to use the device - this is interaction between human and computer. Candidates will be expected to explain the support the operating system provides, to enable user interaction. Explain the characteristics and performance of peripherals. a. Display devices b. Printers c. Keyboards d. Input/output techniques: peripheral polling, interrupt driven I/O. Candidates should be able to describe input and output techniques. Candidates will be expected to describe the use of a device, rather than describing the device itself.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The unit will be introduced to students through a specific series of lectures, supported by problem-solving practice implemented in interactive tutorials. These lessons will be supported by practice and guided study outside the classroom. Formative assessment is carried out throughout the unit during tutorials and feedback is provided during these tutorials. The main strategy to be adopted in delivering this unit is to encourage students' participation in the exercises, while at the same time improving and expanding their critical thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

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

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction into Computer Science
Week 2	Microsoft Office programs
Week 3	Introduction into Microsoft Word
Week 4	Microsoft Word Features
Week 5	Lists and Tabs in Word Part1
Week 6	Part2
Week 7	Introduction into Microsoft Excel
Week 8	**Mid exam**
Week 9	Plotting and Static in Excel
Week 10	Function in Excel
Week 11	Using Equation in Sheets
Week 12	Formatting and Export data from Excel
Week 13	Power Point
Week 14	Features of Power Point
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Principles and application of Computer Science
Week 2	Microsoft Office
Week 3	Introduction into Microsoft Word
Week 4	Using Tabs in Word Part 1
Week 5	Part 2
Week 6	Part 3
Week 7	**Mid exam**
Week 8	Introduction in Microsoft Excel
Week 9	Using Excel for Static and Plotting
Week 10	Formatting and Using Function within Microsoft Excel
Week 11	Export all data from Excel sheet
Week 12	Introduction into PowerPoint
Week 13	Lists and Tabs in Microsoft PowerPoint
Week 14	Preparatory week
Week 15	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Computer Fundamentals, Priti Sinha, Pradeep K., Sinha, 6th edition, ISBN-13, BPB Publications, 2004.	No (Available as an e-book)
Recommended Texts		
Websites		

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.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	ARABIC		**Module Delivery**	
Module Type	BASIC		☒**Theory** ☒**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	URARA			
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level	1		**Semester of Delivery**	2
Administering Department	MPHY		**College**	College of Science
Module Leader	Omar Adnan		**e-mail**	mailto:omar.adnan@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.
Module Tutor	None		**e-mail**	
Peer Reviewer Name			**e-mail**	
Review Committee Approval			**Version Number**	

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 Aims أهداف المادة الدراسية	The main objective of this semester is to strengthen the Queen of First Graders and develop their linguistic abilities and focus on: .1 Acquiring knowledge skills about linguistic concepts .2 Keep the tongue from falling into the word's pronunciation error .3 Developing the student's expressive abilities .4 Teaching students to analyze the speech system 5. Teach students to distinguish between the origins of the word or increase and what it does in increasing meaning. 6. Teaching students on methods and rules of control and drafting of vocabulary. 7. Enabling the student to use the language vocabulary in the proper location 8. Provide trainings to strengthen the student's queen and develop his ability in language practice and influential rhetoric, taking advantage of experiences and training. 9. Enabling students to read and analyze literary texts, understand them and be able to save them. 10. Teaching students to read properly the words of the Holy Quran, learn its meaning and develop students' ability to keep and pronounce.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The University of Nahrain works by teaching Arabic to strengthen the student's linguistic queen. By adjusting and perfecting the rules of Arabic, introducing students to speech systems and the possibility of contributing to the teaching and refinement of writing and damaged times, and being able to know the divisions of actions. This develops students' ability to understand the subject. and have the ability to detect language errors. Teaching the right reading and understanding of educational grammatical systems and developing the skill in addressing the problems faced by students in teaching Arabic and directing it correctly.
Indicative Contents المحتويات الإرشادية	Students should be able to understand the basic principles of Arabi by studying the sections of speech (name, verb and letter) and describing the definition of each of them and what their connotation is. Innovative knowledge, experience and detailed knowledge of its types with representation the study was made by her sisters, the statement of her meaning, her work, what changes occurred in the sentence when she entered it, how to write the number, numbering marks, tied and open tags, and other topics of interest to the student in learning the principles of Arabic.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. POWERPOINT DISPLAY 2. Writing Reports 3. Quarterly Tests 4. Discussing and Solving Questions 5 Homework

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Seminar	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	20% (20)	7	LO # 1-7
	Final Exam	2hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Grammar - Speech Section (Name, verb, letter), beginner, types, news and types
Week 2	It was her sisters, her sisters.
Week 3	Muthanna and his attachment, the collection of the peaceful masculine and his attachment, the collection of the peaceful feminine and his attachment, the five names
Week 4	Building the past act, building the act.
Week 5	The tense act of building and godmother
Week 6	Assigned names (effect - absolute effect - effect - effect - effect - effect)
Week 7	Hair - Nazik Angels
Week 8	Poetry - Mohammed Mahdi Al Jawahiri
Week 9	Dictatorship - Writing the Shame (Connecting and Cutting)
Week 10	Intermediate and Extreme Shaking
Week 11	Writing Antidote and Adversity
Week 12	Writing short and long diversion
Week 13	Punctuation -The rule of a thousand paradoxes
Week 14	Writing Number
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Expression, creation, written drawing and written dictation/a. d. Abdulrahman Matlak al-Jabouri	No
Recommended Texts	Clarify the trajectory of the millennium of the son of Malik/Ibn Hisham. Qatar al-Nada and Bel al-Echo of Hisham's son. The hummus of the Sooty, as adequate as Abbas Hassan, is a shrewd custom in the art of drainage, polite in drainage.	No
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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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Ministry of Higher Education and Scientific Research - Iraq
Al-Nahrain University
College of Science
Department of Medical Physics

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	General Biology			**Module Delivery**	
Module Type	Suplement			☒**Theory** ☒**Lecture** ☒**Lab** ☐**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	FORE 1102				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		1	**Semester of Delivery**		2
Administering Department		MPHY	**College**	College of Science	
Module Leader	Dr. Ibrahim Kanaan ahmed		**e-mail**	ibrahimkanaan@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor	Nada Mohammed		**e-mail**	Nada.csc23@ nahrainuniv.edu.iq	
Module Reviewer	Zainab Ali Abdalhussain		**e-mail**	Zainab.ali@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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 Aims أهداف المادة الدراسية	**At the end of the course, the students will be able to:** • Explain the scope of biology and molecular basis of life • Describe life activities from the cellular point of view • Manipulate basic biological tool, record data and draw conclusions • Develop scientific attitude, skill and conduct biological experiments using scientific procedures • Outline basic processes of energy transduction and synthesis of intermediate or final products in living cells • Understand the basic concepts of genetics and inheritance
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	**Module 1: Introduction to Biology** **Define biology and apply its principles** • List the defining characteristics of biological life • Identify the different kinds of cells that make up different kinds of organisms • Describe classification and organizational tools biologists use, including modern taxonomy • Describe biology as a science and identify the key components of scientific inquiry **Module 2: Cellular Structure** **Identify and explain a variety of cellular components** • Understand why and how the light microscope and electron microscope are used in biology • Identify membrane-bound organelles found in eukaryotic cells • Demonstrate familiarity with various components of the cytoskeleton, including monomeric units • Demonstrate familiarity with various cell surface specializations **Module 3: Cell Division** **Describe and explain the various stages of cell division** • Understand chromosome structure and organization in eukaryotic cells • Identify the stages of the cell cycle, by picture and by description of major milestones • Identify and explain the important checkpoints that a cell passes through during the cell cycle • Identify the stages of meiosis by picture and by description of major milestones; explain why meiosis involves two rounds of nuclear division

	• Describe and explain a range of mechanisms for generating genetic diversity • Examine karyotypes and identify the effects of significant changes in chromosome number **Module 4: Cell Membranes** **Describe and explain the structure and function of membranes** • Describe the structure and function of membranes, especially the phospholipid bilayer • Distinguish between passive and active transport; explain how substances are directly transported across a membrane • Describe the primary mechanisms by which cells import and export macromolecules **Module 5: DNA Structure and Replication** **Relate DNA structure to the process of DNA replication** • Explain how DNA stores genetic information • Explain the role of complementary base pairing in the precise replication process of DNA • Recognize the impact of DNA mutations **Module 6: DNA Transcription and Translation** **Describe the conversion of DNA to RNA to proteins** • Outline the process of genetic transcription • Summarize the process of genetic translation • Outline the process of prokaryotic transcription and translation • Identify the central dogma of life
Indicative Contents المحتويات الإرشادية	**Indicative content includes the following.** Introduction to human biology: History and milestones in the field of human biology Basic concepts of human biology and applications. A blood type (also known as a blood group) is a classification of blood, based on the presence and absence of antibodies and inherited antigenic substances on the surface of red blood cells (RBCs). These antigens may be proteins, carbohydrates, glycoproteins, or glycolipids, depending on the blood group system. DNA as the genetic material because of the apparent simplicity of its chemistry. DNA was known to be a long polymer composed of only four types of subunits, which resemble one another chemically. A DNA molecule consists of two long polynucleotide chains composed of four types of nucleotide subunits. Each of these chains is known as a DNA chain, or

	a DNA strand. Hydrogen bonds between the base portions of the nucleotides hold the two chains together. Chromosomes are thread-like structures present in the nucleus. They are important because they contain the basic genetic material DNA. These are present inside the nucleus of plants as well as animal cells. Chromosomes were first discovered by Strasburger in 1815 and the term 'chromosome' was first used by Waldeyer in 1888. Human beings have 46 chromosomes in their body. These are arranged into 23 pairs. "A Chromosome looks like a thread and is coiled material, made of proteins. Chromosomes are present in the nucleus of all the cells and contain the basic genetic material DNA, which passes from one generation to another". **Structure:** A chromosome has generally 8 parts; Centromere or primary constriction or kinetochore, chromatids, chromatin, secondary constriction, telomere, chromomere, chromonema, and matrix. Centromere or Kinetochore: It is the primary constriction at the center to which the chromatids or spindle fibers are attached. Its function is to enable movement of the chromosome during the anaphase stage of cell division. Chromatid: During cell division, a chromosome is divided into 2 identical half strands joined by a centromere. **Laboratory Skills:** Laboratory technician skills refer to the ability to carry out specialized tasks in a laboratory setting. Laboratory technicians perform specialized scientific tests, often for technical or diagnostic purposes, for which tasks such as hypothesizing, keeping records, dissecting, pipetting, measuring and sterilizing are common. To complete these tasks and others, laboratory technicians need a combination of hard and soft skills to ensure they follow guidelines and produce accurate laboratory results.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching strategies used in general biology and their expected results in terms of acquiring knowledge and achieving learning outcomes for students were as follows: **1. Competitive academic** • Students work individually. • Students have common learning goals and tasks. **2. Individualistic learning** • Students work individually and independently to achieve various individual learning goals and tasks that are not related to other students. **3. Cooperative learning** • Students work in small groups. • Students shared learning objectives and tasks within the group that may be similar or different from other groups. • The professor evaluates the students on their work as groups and also on their individual work

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	5% (5)	Continuous	All
	Lab	1	15% (15)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO # 1-7
	Final Exam	4hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction and basic principle of human biology
Week 2	Cell: Structure, properties and classification (part 1)
Week 3	Cell: Structure, properties and classification (part2)
Week 4	Tissue: Structure, properties; classification and function(patr1)
Week 5	Tissue: Structure, properties; classification and function(part2)
Week 6	Circulatory system; Blood
Week 7	Skin and Hair
Week 8	Mid exam
Week 9	Structure and Function of DNA
Week 10	Structure and Function of DNA
Week 11	Genetic basis of DNA typing
Week 12	Human chromosomes
Week 13	Chromosomes variations
Week 14	Human genetics and Semi-lethal gene
Week 15	Final exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Laboratory safety roles
Week 2	Types of microscopes and Parts of the Microscope
Week 3	Eukaryotic Cell Structure
Week 4	Tissue: classification and function(patr1)
Week 5	Tissue: classification and function(part2)
Week 6	Mid exam
Week 7	Microscopic comparison between eukaryotic and prokaryotic cells
Week 8	DNA Extraction

Week 9	The Cell Cycle & Mitosis, Patterns of Inheritance
Week 10	Explain hematocrit, including the significance of values outside of the normal range
Week 11	Determine hematocrit from a blood sample image.
Week 12	Explain the ABO and Rh blood groups and their clinical significance.
Week 13	Identify and describe all formed elements in a human blood smear. Part 1
Week 14	Identify and describe all formed elements in a human blood smear. Part 2
Week 15	final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Reference book: Johnks and lnglis(eds.) Text book of Human Biology, 3rd Ed.	No (Available as an e-book)
Recommended Texts		
Websites		

APPENDIX:

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
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	F – Fail	راسب	(0-44)	Considerable amount of work required

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	Organic Chemistry	**Module Delivery**	
Module Type	CORE		☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**
Module Code	CREQ1104		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	1	**Semester of Delivery**	2
Administering Department	MPHY	**College**	College of Science
Module Leader	Dr. Talib Hamid Mawat	**e-mail**	Dr.talib_h@nahrainuniv.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	PhD
Module Tutor	Shams aws ismael	**e-mail**	Shams.aws@nahraininiv.edu.iq
Module Reviewer	Dena ahmed hashem		Dina.ahmed@nahrainuniv.edu.iq
Peer Reviewer Name		**e-mail**	
Review Committee Approval	18/1/2026	**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 Aims أهداف المادة الدراسية	1. Provide students with a solid foundational understanding of organic chemistry principles. 2. Introduce and explain core topics, including chemical bonding, molecular structure, organic nomenclature, the reactivity of fundamental functional groups, and the chemistry of single, double, and triple bonds. 3. Explore organic molecules of biological and life-related significance, highlighting their roles and importance. 4. Establish a unified baseline of organic chemistry knowledge for all incoming first-year students, ensuring academic consistency and preparedness. 5. Develop students' practical and laboratory skills in organic chemistry, enabling them to apply theoretical concepts through hands-on experimentation
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. The student will be able to identify, classify, and systematically name organic compounds based on their molecular structure, functional groups, and the IUPAC nomenclature rules for alkanes, alkenes, and alkynes. 2. The student will be able to describe the nature of bonding in organic molecules and explain how different types of bonds influence molecular geometry and three-dimensional structure. 3. The student will be able to explain the key factors that affect the reactivity of organic molecules, including functional groups, steric effects, and electronic effects. 4. The student will be able to describe the physical and chemical properties of alkanes, alkenes, and alkynes, as well as their methods of preparation and characteristic reactions. 5. The student will be able to apply knowledge of organic molecular structure, bonding, reactivity, and functional groups to predict reaction outcomes and solve fundamental problems in organic chemistry.

Indicative Contents المحتويات الإرشادية	1. Structure and bonding in organic molecules: 2. An introduction to molecular structure, including bond types, bond polarity, and the three-dimensional shapes of organic molecules, and how bonding influences molecular stability and behavior. 3. Functional groups: 4. Classification of organic compounds based on functional groups, with emphasis on how specific atomic arrangements determine characteristic chemical and physical properties. 5. Nomenclature: 6. Principles of systematic organic nomenclature, including the IUPAC naming rules used for clear and consistent identification of organic compounds. 7. Isomerism: 8. Types of isomerism in organic chemistry, including structural and stereoisomerism, and how different atomic arrangements or spatial orientations result in distinct chemical properties. 9. Organic reactions: 10. Fundamental concepts of organic reactions, focusing on reaction types, reaction mechanisms at the molecular level, and factors affecting reaction pathways. 11. Stereochemistry: 12. The study of the three-dimensional arrangement of atoms in organic molecules and its effect on molecular properties, reactivity, and biological interactions.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary approach to delivering this unit focuses on promoting active student engagement through regular homework assignments that encourage analysis and critical thinking. Learning will be supported through interactive lectures and tutorial sessions, alongside simple, guided experiments that introduce basic sampling activities aligned with students' interests to reinforce conceptual understanding and practical skill

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	135	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to organic chemistry
Week 2	The structural theory of matter
Week 3	Bonds and Lewis structures
Week 4	Hybridization of atomic orbitals
Week 5	Acids and bases
Week 6	Alkanes: the nomenclature and physical properties
Week 7	Alkanes: free radical reactions
Week 8	Synthesis of alkanes
Week 9	Alkenes: nomenclature and physical properties
Week 10	Synthesis of alkenes
Week 11	Reactions of alkenes
Week 12	Alkynes: nomenclature and physical properties
Week 13	Synthesis of alkynes
Week 14	Reactions of alkynes
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Lab 1: Lab safety guide and laboratory glass wares
Week 3-4	Lab 2: Crystallization
Week 5-6	Lab 3: Liquid-liquid extraction
Week 7	Lab 4: Soxhlet extraction
Week 8	Mid Exam
Week 9-10	Lab 5: Extracting Caffeine from tea
Week 11-12	Lab 6: Simple and fractional distillation
Week 13-14	Lab 7: Determination of melting point and boiling point
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Bruice, Paula Yurkanis. (2014). Organic Chemistry, 7th ed. New Jersey: Pearson Education International, pages 1392.	Yes
Recommended Texts	McMurry, John E., (2016). Organic Chemistry, 9th ed., Cengage Learning, pages 1518.	No
Websites	https://www.khanacademy.org/science/organic-chemistry https://www.masterorganicchemistry.com/	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.



ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

Ministry of Higher Education and Scientific Research - Iraq
Al-Nahrain University
College of Science
Department of Medical Physics

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	MPHY1207				
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	1		**Semester of Delivery**	2	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Dr. Ahmed Mohammed Abid Al-Asady		**e-mail**	ahmed.m.abid@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Dr.		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Dr. Zaid Malk Abbas		**e-mail**	zaid.malk@nahrainuniv.edu.iq	
Module Reviewer	Dr. Zaid Malk Abbas		**e-mail**	zaid.malk@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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 Aims أهداف المادة الدراسية	At the end of the course, the students will be able to: • Explain the scope of biology and physics. • Describe life activities from biophysics point of view. • Manipulate basic biological tool, record data and draw conclusions • Develop scientific attitude, skill and conduct biophysics experiments using scientific procedures. • Understand the basic concepts of the relation between physics and biology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• To make students know about the relation between sound in medicine. • To make the students understand all about physics and its involvement with medicine.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to medical physics: History and milestones in the field of medical physics Basic concepts of medical physics and applications. The relation of sound in medicine and laser in medicine.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and by considering types of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	135	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Sound in medicine
Week 2	Laser in medicine
Week 3	Power, energy and work of the body
Week 4	Physics of the Skeleton
Week 5	Heat and cold in medicine
Week 6	Pressure in the body
Week 7	Electricity in human body
Week 8	Mid exam
Week 9	Physics of hearing and ear
Week 10	Physics of eye and vision part 1
Week 11	Physics of eye and vision part 2
Week 12	Light and UV in medicine
Week 13	x-ray in medicine part 1
Week 14	x-ray in medicine part 2
Week 15	**final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Laboratory safety roles
Week 2-3	introduction
Week 3-4	Sound in medicine part 1
Week 4-5	Sound in medicine part 2
Week 5-6	Sound in medicine part 3
Week 6-7	Mid exam
Week 7-8	Light Reflection and Refraction part 1
Week 8-9	Light Reflection and Refraction part 2
Week 9-10	Light Reflection and Refraction part 3
Week 10-11	Viscosity part 1
Week 11-12	Viscosity part 2
Week 12-13	Viscosity part 3
Week 13-14	Second Exam.
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Medical Physics by John R. Cameron, International Publication.	No (Available as an e-book)
Recommended Texts	Elements of Biophysics Randall 1998	No (Available as an e-book)
Websites		

APPENDIX:

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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Second course

Semester Four

Level Two

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	Computer 2		**Module Delivery**	
Module Type	BASIC		☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code				
ECTS Credits	3			
SWL (hr/sem)	75			
Module Level			**Semester of Delivery**	
Administering Department	Medical Physics		**College**	Science
Module Leader	Dr. Manar Thayer Mansour		**e-mail**	manar.thaer@nahrainuniv.edu.iq
Module Leader's Acad. Title			**Module Leader's Qualification**	
Module Tutor			**e-mail**	
Peer Reviewer Name			**e-mail**	
Review Committee Approval			**Version Number**	

<table>
<tr><th colspan="4">Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td></td></tr>
<tr><th colspan="4">Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية</th></tr>
<tr><td>Module Aims
أهداف المادة الدراسية</td><td colspan="3"><h2>Module Aims</h2>
Develop Core Competencies: To provide students with a thorough understanding of core concepts in computer science, including algorithms, programming, data structures, and software development.
Enhance Problem-Solving Skills: To equip students with the ability to solve complex problems using computational approaches and logical reasoning.
Introduce Advanced Topics: To expose students to advanced topics such as artificial intelligence, machine learning, cybersecurity, and data analytics.
Foster Ethical Awareness: To instill an understanding of ethical considerations and societal impacts of technology and computing.
Encourage Research and Innovation: To inspire students to engage in research activities and innovative projects.
<h2>Learning Outcomes</h2> By the end of the module, students should be able to: Understand Key Concepts: Demonstrate a deep understanding of fundamental and advanced computer science concepts.
Apply Programming Skills: Develop and implement efficient algorithms and programs using multiple programming languages.
Analyze and Solve Problems: Critically analyze problems and develop effective computational solutions.
Conduct Research: Perform independent research and contribute to the body of knowledge in the field of computer science.
Ethical Practices: Recognize and adhere to ethical standards and practices in computing and technology.
Communicate Effectively: Present technical information clearly and effectively, both in written and oral forms.
Work Collaboratively: Collaborate effectively within multidisciplinary teams.</td></tr>
<tr><td>Module Learning Outcomes</td><td colspan="3"><h2>Learning Outcomes</h2></td></tr>
</table>

مخرجات التعلم للمادة الدراسية	1. **Knowledge and Understanding**: o Demonstrate a comprehensive understanding of fundamental computer science principles and concepts, such as algorithms, data structures, and software engineering. o Explain the theoretical foundations of computer science, including computational theory and complexity. o Discuss the ethical, social, and legal implications of computing technologies. 2. **Practical Skills**: o Design and implement software solutions using appropriate programming languages and development tools. o Apply problem-solving techniques to develop efficient and effective algorithms. o Use software engineering principles and methodologies to manage and execute projects. 3. **Research and Analysis**: o Conduct research to stay updated with the latest advancements in computer science. o Analyze and evaluate computing systems and technologies. o Critically assess and synthesize research findings to inform practice and development. 4. **Communication and Collaboration**: o Communicate technical information effectively through written reports and oral presentations. o Work collaboratively in teams to achieve common goals and solve complex problems. o Demonstrate interpersonal skills and the ability to give and receive constructive feedback. 5. **Professional Development**: o Exhibit professionalism and ethical behavior in all aspects of work. o Develop a lifelong learning mindset to continuously improve skills and knowledge. o Prepare for professional careers in computer science by understanding industry standards and practices. 6. **Application and Integration**: o Apply theoretical knowledge to practical scenarios and real-world problems. o Integrate various computer science concepts and skills to develop comprehensive solutions. o Demonstrate the ability to learn and adapt to new technologies and methodologies.
Indicative Contents المحتويات الإرشادية	• **Introduction to Computer Science**

	• History and evolution of computing • Overview of computer systems and architecture • Basics of computer hardware and software • **Programming Fundamentals** • Basic syntax and semantics of programming languages (e.g., Python, Java, C++) • Control structures, functions, and data types • Introduction to object-oriented programming concepts • **Data Structures and Algorithms** • Arrays, linked lists, stacks, queues, trees, and graphs • Sorting and searching algorithms (e.g., bubble sort, merge sort, binary search) • Algorithm complexity and Big-O notation • **Software Development** • Software development lifecycle (SDLC) • Agile methodologies and version control (e.g., Git) • Debugging and testing techniques • **Database Systems** • Relational databases and SQL • Data modeling and database design • Transactions and concurrency control • **Operating Systems** • Processes, threads, and concurrency • Memory management and file systems • Security and protection mechanisms • **Networks and Communications** • Network architectures and protocols • Data transmission and network security • Internet and web technologies • **Artificial Intelligence and Machine Learning** • Introduction to AI concepts and techniques • Machine learning algorithms and applications (e.g., supervised learning, unsupervised learning)

	• Neural networks and deep learning
	
	• **Cybersecurity**
	
	  • Fundamentals of cybersecurity and cryptography
	  • Threats, vulnerabilities, and risk management
	  • Secure coding practices and incident response
	
	• **Human-Computer Interaction**
	
	  • Principles of user interface design
	  • Usability testing and evaluation
	  • Accessibility and user experience (UX) design
	
	• **Computer Graphics**
	
	  • Fundamentals of computer graphics
	  • Rendering techniques and algorithms
	  • Graphics programming and visualization
	
	• **Theory of Computation**
	
	  • Automata theory and formal languages
	  • Turing machines and computational complexity
	  • Decidability and undecidability
	
	• **Capstone Project**
	
	  • Integration of knowledge and skills from various areas of computer science
	  • Collaborative project development
	  • Presentation and demonstration of the final project

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Study Strategies** 1. **Understand the Basics**: Make sure you have a solid grasp of fundamental concepts like algorithms, data structures, and programming principles. These are the building blocks for more advanced topics. 2. **Practice Regularly**: Regular coding practice helps reinforce concepts and improves problem-solving skills. Websites like LeetCode, HackerRank, and Codeforces are great for practicing coding problems.

3. **Work on Projects**: Building real-world projects allows you to apply your knowledge and gain practical experience. Choose projects that interest you and align with your career goals.
4. **Learn Multiple Languages**: While specializing in one programming language is important, having a working knowledge of several languages (e.g., Python, Java, C++) can be beneficial.
5. **Participate in Competitions**: Joining coding competitions and hackathons can challenge you to think creatively and work under pressure. It's also a great way to network with other professionals.

Learning Resources

1. **Online Courses**: Platforms like Coursera, edX, and Udacity offer comprehensive courses on various computer science topics, often taught by industry experts and professors.
2. **Books**: Invest in well-regarded textbooks like "Introduction to Algorithms" by Cormen, Leiserson, Rivest, and Stein (CLRS), and "Clean Code" by Robert C. Martin.
3. **Tutorials and Documentation**: Websites like W3Schools, Mozilla Developer Network (MDN), and Stack Overflow are invaluable for tutorials and troubleshooting.
4. **Research Papers and Journals**: Stay updated with the latest advancements by reading research papers and journals in your areas of interest.

Problem-Solving Techniques

1. **Break Down Problems**: Divide complex problems into smaller, manageable parts. This approach makes it easier to tackle each part individually.
2. **Think Algorithmically**: Develop a habit of thinking about problems in terms of algorithms and data structures. This mindset will help you design efficient solutions.
3. **Debugging Skills**: Master the art of debugging. Use tools like print statements, debuggers, and logging to identify and fix issues in your code.
4. **Optimize Solutions**: Always strive to improve the efficiency of your solutions. Consider time and space complexity when designing algorithms.

Professional Development

1. **Networking**: Join professional organizations, attend conferences, and participate in online forums to network with peers and industry experts.
2. **Soft Skills**: Develop soft skills such as communication, teamwork, and project management. These are crucial for collaborating effectively in professional settings.

	3. **Stay Updated**: Technology evolves rapidly, so it's important to stay informed about the latest trends and advancements in the field. 4. **Certifications**: Obtain relevant certifications to validate your skills and knowledge. Popular certifications include AWS Certified Developer, CompTIA Security+, and Certified Ethical Hacker (CEH). **Career Strategies** 1. **Internships and Co-ops**: Gain practical experience through internships and cooperative education programs. These opportunities provide valuable insights into the industry. 2. **Personal Branding**: Create a professional online presence through a personal website, LinkedIn profile, and GitHub repository. Showcase your projects, achievements, and skills. 3. **Mentorship**: Seek out mentors who can provide guidance, support, and advice as you navigate your career path. 4. **Lifelong Learning**: Commit to continuous learning and professional development. The field of computer science is ever-changing, and staying ahead requires a commitment to growth.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	75	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All

Total assessment	100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Security and Networking, Security and Networking (Cont.): Network Security Basics. Understanding network threats. Network Troubleshooting
Week 2	Security and Networking (Cont.): Introduction to Network Troubleshooting, Common Network Issues and Symptoms, Network Troubleshooting Tools and Utilities, Security and Networking (Cont.): Using Command-Line Tools for Diagnostics, Identifying and Resolving Connectivity Issues, Diagnosing Network Performance Problems
Week 3	E-Commerce: Concepts of Electronic banking services this includes online banking: ATM and debit c a r d services, E-Commerce (Cont.): Phone banking, SMS banking, electronic alert, Mobile banking.
Week 4	Computer Troubleshooting: Introduction to Computer Troubleshooting, Common Hardware Issues and Solutions, Diagnosing Software Problems, Computer Troubleshooting (Cont.): Hardware Components: Diagnosis and Repair, Using Safe Mode for Troubleshooting.
Week 5	Computer Troubleshooting (Cont.): Troubleshooting Operating System Issues, Identifying and Resolving Blue Screen Errors, Dealing with Slow Computer Performance, Computer Troubleshooting (Cont.): Virus and Malware Removal Techniques, Updating Drivers and software
Week 6	Introduction to Al: Definition of Al, History of Al, Al Techniques and Approaches, Introduction to Al (Cont.): Key Characteristics of Al, Benefits of Al, Challenges and Ethical considerations, Introduction to Al (Cont.): Challenges and Limitations of Al, The Role of Data in Al Systems
Week 7	introduction to Al (Cont.): Al Tools and Frameworks, The Role of Al in Modern Smartphones: Al-Driven Mobile Technologies, Virtual Assistants (Siri, Google Assistant, Alexa), The Role of Al in Modern Smartphones (Cont.): Adaptive Learning, Real-Time Translation Services
Week 8	The Role of Al in Modern Smartphones (Cont.): The Future of Al in Smartphone Technology, Challenges of Implementing Al in Mobile Devices, Applications and Tools of Al:

	Overview of Al Applications in Various Industries, Education and Healthcare. Applications and Tools of Al (Cont.): Transportation and Advertising
Week 9	applications and Tools of Al (Cont.): Finance, Robotics and Automation Technologies, Applications and Tools of Al (Cont.): Al in Marketing: Targeting and Personalization
Week 10	Applications and Tools of Al (Cont.): Al in Image and Video Analysis, Smart Cities, Applications and Tools of Al (Cont.): Future Trends in Al Applications and Tools
Week 11	Al and Society: Introduction to Al and Its Societal Impact, The Role of Al in Enhancing Public Safety, Al and Society (Cont.): Cultural Perspectives on Al Adoption, Al and Governance: Policy Implications
Week 12	Ethical Challenges in Al: Introduction to Ethics in Al, Transparency and Explain ability of Al Systems, Privacy Concerns in Al Data Usage,
Week 13	Ethical Challenges in Al (Cont.): The Ethical Implications of Autonomous Systems, Ethics in Al- Driven Marketing and Advertising
Week 14	Ethical Challenges in Al (Cont.): Ethical Considerations in Education, Human Rights and Al Implementation, The Future of Al: Future trends in Al, recent research and emerging technologies
Week 15	
Week 16	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to MATLAB environment, interface, and basic commands
Week 2	Lab 2: Variables, data types, and basic mathematical operations
Week 3	Lab 3: Vectors and matrices: creation, manipulation, and indexing
Week 4	Lab 4: Matrix operations and built-in mathematical functions
Week 5	Lab 5: Scripts and basic programming concepts in MATLAB
Week 6	Lab 6: Logical operations and conditional statements (if, else, switch)
Week 7	Lab 7: User-defined functions and function files

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Artificial Intelligence: A Modern Approach — Stuart J. Russell & Peter Norvig	
Recommended Texts	Machine Intelligence: Concepts and Mathematics	
Websites	AI Foundations and Applications with MATLAB (Springer)	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Medical Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	NEW HEADWAY PLUS	**Module Delivery**	
Module Type	BASIC	☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code			
ECTS Credits	2		
SWL (hr/sem)			
Module Level		**Semester of Delivery**	3
Administering Department	Department of Medical Physics	**College**	College of Sciences
Module Leader	Assist. Lect. Israa Namh Abdula	**e-mail**	israa.alsultani@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	**Module Leader's Qualification**	Master's Degree
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	None	**e-mail**	None
Review Committee Approval	Feb. 8, 2026	**Version Number**	

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 Aims أهداف المادة الدراسية	1. Developing Basic Communication Skills: - Enable students to express themselves effectively in everyday situations. - Focus on building a foundation in speaking and listening. 2. Enhancing Reading Comprehension: - Improve students' ability to understand and interpret written texts. - Introduce strategies for effective reading comprehension. 3. Strengthening Writing Proficiency: - Develop students' writing skills across different genres (e.g., essays, emails, reports). - Emphasize grammar, sentence structure, and vocabulary usage. 4. Listening Skills Development: - Improve students' ability to comprehend spoken English in various contexts. - Provide exposure to different accents and speaking speeds. 5. Effective Presentation Skills: - Equip students with the skills to deliver clear and engaging presentations. - Focus on aspects such as organization, delivery, and visual aids.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Students will demonstrate the ability to initiate and sustain simple conversations in English. 2. Students will be able to deal with the basics of English language Grammar. 3. Students will enhance their knowledge of pathology-related vocabulary. 4. Students will be able to ask and respond to basic questions related to personal information, daily activities, and immediate surroundings. 5. Students will exhibit improved reading comprehension by accurately summarizing and analyzing information from a variety of texts. 6. Students will deliver clear and organized presentations using appropriate language and visuals.
Indicative Contents المحتويات الإرشادية	Advanced Communication Skills: • Greetings and introductions • Describing daily routines Reading Comprehension: • Reading stories and articles • Comprehension exercises with questions Writing Proficiency: • Article writing

	• Summarizing various texts Vocabulary Expansion: • Everyday vocabulary • Academic vocabulary Listening Skills Development: • Listening to dialogues and conversations • Podcasts and audio materials
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Emphasize interactive and communicative activities to engage students actively in the learning process • Design tasks that require students to use English to accomplish specific goals, fostering language use in context. • Recognize and accommodate diverse learning styles and paces within the classroom. • Incorporate authentic materials like newspaper articles, blogs, or videos to expose students to real-life language use. • Implement ongoing formative assessments, such as quizzes, peer evaluations, and class discussions, to gauge student progress. • Provide constructive feedback on both spoken and written language, and encourage students to reflect on their learning experiences • Adapt lesson plans based on the evolving needs and interests of the students, allowing for flexibility in the teaching approach.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	32	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	18	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	5, 10	LO # 2, 1, 5
	Report	1	10% (10)	11	LO # 1,6
	Assignments	1	10% (10)	10-14	
	Presentation	1	10% (10)	14	LO # 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
الأسبوع الاول	Introduction to the course, syllabus, and expectations.
الأسبوع الثاني	Unit One of the textbook: Tenses – writing formal e-mails
الأسبوع الثالث	Unit Two of the textbook: Describing objects and people – Collocations
الأسبوع الرابع	Grammar: Irregular verbs- making connections with words
الأسبوع الخامس	Writing Skills: Basics of academic writing
الأسبوع السادس	Reading Comprehension: Reading extracts from a novel+ discussions
الأسبوع السابع	**Mid-Exam**
الأسبوع الثامن	Unit Three of the textbook: Quantity – Articles – Medical Physics-related vocabulary part1
الأسبوع التاسع	Writing basics: Summarizing texts – how to extract information from various texts
الأسبوع العاشر	Grammar: Passive and active voice- Reported speech
الأسبوع الحادي عشر	Listening skill: Listening to a podcast- discussions
الأسبوع الثاني عشر	Speaking skill: Exchanging and discussing information about DNA and Google
الأسبوع الثالث عشر	Unit Four of the textbook: Pathology-related vocabulary part2 - Comparative and superlative adjectives
الأسبوع الرابع عشر	Writing and talking about personal interests. -Group activity: planning a class event based on shared interests.
الأسبوع الخامس عشر	**final exam preparation**

الأسبوع السادس عشر	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	New Headway Plus: Pre-intermediate	
Recommended Texts	Think Big (Recommended Book)	
Websites	www.youtube.com (short videos+ chosen movies)	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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.

ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Physiology**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code					
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		UG– Year 2	**Semester of Delivery**		Semester 2
Administering Department		Medical Physics	**College**	College of Science	
Module Leader	Dr. Ruaa Hameed Abdulridha		**e-mail**	ruaa.hameed@nahrainuniv.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph. D.
Module Tutor	Nada Mohammed Aliwi		**e-mail**	nada.csc23@nahrinuniv.edu.iq	
Peer Reviewer Name		Nada Mohammed Aliwi	**e-mail**	nada.csc23@nahrinuniv.edu.iq	
Scientific Committee Approval Date			**Version Number**		1.0
Laboratory Staff	Dr. Ruaa Hameed Abdulridha, MSc. Nada Mohammed Aliwi, MSc. Tabark Mohammed Khalid, MSc. Al-Mustafa Mahdi Salih				

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 Aims أهداف المادة الدراسية	This module aims to provide students with a comprehensive understanding of the fundamental principles of human physiology, with emphasis on the integration of biological functions and their physical foundations. The module introduces the physiological mechanisms of major body systems and highlights the role of physical principles and medical applications in physiological processes. It also aims to develop students' analytical skills through laboratory experiments and the interpretation of physiological data.
Module Learning Outcomes **مخرجات التعلم للمادة الدراسية**	At the end of this module, students will be able to: **1.** Explain the basic concepts of physiology, levels of biological organization, and the importance of homeostasis in maintaining internal balance. **2.** Describe the structure and function of neurons and explain the mechanisms of nerve impulse generation and transmission. **3.** Analyze synaptic transmission and the role of neurotransmitters in neural communication. **4.** Distinguish between different types of muscles and explain the physiological mechanisms of muscle contraction. **5.** Interpret the relationship between neural control and muscle activity, including basic applications of electromyography (EMG). **6.** Describe the structure and function of the heart and explain the electrical activity of the cardiac cycle using ECG principles. **7.** Explain blood circulation dynamics, arterial blood pressure, and their relationship to physical laws of fluid flow. **8.** Describe the mechanisms of respiration, gas exchange, and lung volumes, and interpret basic spirometry measurements. **9.** Explain the physiological functions of the digestive, urinary, and endocrine systems and their regulatory mechanisms. **10.** Integrate knowledge of different physiological systems and relate physiological concepts to medical and physical applications.

	11. Perform basic physiological laboratory measurements safely and accurately and analyze experimental data effectively.
Indicative Contents المحتويات الإرشادية	**1. Introduction to Physiology** • Definition and scope of physiology • Levels of biological organization • Principles of biological regulation • Homeostasis and feedback mechanisms **2. Nervous System Physiology** • Structure and function of neurons • Resting membrane potential and action potential • Neural signal conduction **3. Synaptic Transmission** • Chemical synapses • Neurotransmitters and receptors • Regulation of neural signaling **4. Muscle Physiology** • Types of muscles: skeletal, smooth, and cardiac • Mechanism of muscle contraction • Excitation–contraction coupling **5. Neuromuscular Function** • Neural control of muscle activity • Force transmission • Introduction to EMG and physical applications **6. Cardiovascular System** • Structure and function of the heart • Electrical activity of the heart • Cardiac cycle and ECG principles **7. Blood Circulation and Blood Pressure** • Blood flow and resistance • Arterial blood pressure • Relationship with fluid physics

	8. Respiratory System • Mechanisms of breathing • Gas exchange and partial pressures • Lung volumes and capacities **9. Physics of Respiration** • Spirometry measurements • Lung compliance and respiratory adaptation **10. Digestive System** • Digestion and absorption of nutrients • Enzymatic activity • Neural and hormonal regulation **11. Urinary System** • Kidney structure and function • Filtration, reabsorption, and secretion • Physical principles of filtration **12. Endocrine System** • Hormones and mechanisms of action • Regulation of physiological functions **13. System Integration** • Interaction between body systems • Comparative physiology • Medical and physical applications **14. Review and Assessment** • Integration of physiological concepts • Preparation for final examination

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**Learning Strategies:** The module is delivered using a combination of student-centered and instructor-guided teaching strategies designed to promote active learning and conceptual

	understanding. Teaching strategies include: • Interactive Lectures: Structured lectures supported by visual aids and real-life medical and physical examples to introduce core physiological concepts and theoretical foundations. • Problem-Based Learning: Use of applied physiological problems and clinical/biophysical scenarios to enhance analytical thinking and conceptual integration. • Laboratory Demonstrations and Practical Sessions: Hands-on laboratory experiments (e.g., ECG, EMG, spirometry) to reinforce theoretical knowledge through direct observation and measurement. • Discussion Sessions: Guided discussions to encourage student participation, critical thinking, and clarification of complex physiological mechanisms. • Case-Based Teaching: Analysis of integrated physiological case studies to demonstrate interaction between body systems and real-world applications. • Use of Educational Technology: Multimedia presentations, simulation tools, and data acquisition systems to support visualization and understanding of physiological processes. • Continuous Feedback: Ongoing formative feedback during lectures, labs, and assessments to support student progress and learning improvement. **Teaching Strategies:** Students are encouraged to adopt active and self-directed learning strategies throughout the module. Learning strategies include: • Active Participation: Engagement in lectures, discussions, and laboratory sessions to enhance understanding and retention of physiological concepts. • Independent Study: Regular review of lecture materials, textbooks, and recommended scientific resources to reinforce theoretical knowledge.

	• Practical Skill Development: Active involvement in laboratory experiments to develop measurement, observation, and data interpretation skills. • Collaborative Learning: Group work during practical sessions and case discussions to promote teamwork and peer learning. • Problem Solving: Practice in analyzing physiological data and solving applied problems related to biological and physical principles. • Reflective Learning: Reflection on experimental results and feedback to improve understanding and practical performance. • Integration of Knowledge: Linking concepts across different physiological systems to achieve a holistic understanding of human physiology.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/Sem) الحمل الدراسي المنتظم للطالب خلال الفصل	80	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/Sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	70	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.6
Total SWL (h/Sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
As		**Time/Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	Continuous	All
	Assignments & H. W	2	10% (10)	Continuous	All
	Projects\Lab	1	15% (15)	Continuous	All
	Seminar	1	5% (5)	Continuous	All
Summative assessment	**Midterm Exam**	1 hr.	10% (10)	Continuous	All
	Final Exam	3 hr.	50% (50)	Continuous	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction to Physiology and Principles of Biological Regulation** Concept of physiology, levels of biological organization, and importance of homeostasis.
Week 2	**Nervous System — Fundamentals** Structure and function of the neuron, resting potential, and action potential.
Week 3	**Neural Reception and Transmission** Synaptic transmission, neurotransmitters, and signal regulation.
Week 4	**Muscles — Basic Physiology** Types of muscles (skeletal, smooth, cardiac), mechanism of contraction.
Week 5	**Muscles — Structure and Function in the Body** Force transmission, neural control of muscles, and physical applications (EMG).
Week 6	**Cardiovascular System — The Heart** Structure of the heart, electrical cardiac cycle, ECG (physical applications).
Week 7	**Mid-term Exam**
Week 8	**Blood Circulation and Arterial Blood Pressure** Blood flow, resistance, pressure factors, and relationship with fluid physics.
Week 9	**Respiratory System — Basic Principles** Gas exchange, mechanisms of breathing, and partial pressure of gases.
Week 10	**Physics of Respiration and Adaptation** Lung capacities, lung fibers, and respiratory measurements (spirometry).
Week 11	**Digestive System and Organ Functions** Nutrient absorption, enzymes, neural, and hormonal regulation.
Week 12	**Urinary System and Urine Formation** Kidney function, filtration, reabsorption, physics of filtration.
Week 13	**Endocrine System** Hormones, mechanisms of action, and regulation of vital functions.
Week 14	**Preparatory Week**
Week 15	**Comparative Physiology and System Integration** General review, integration between systems, medical and physical applications.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Lab 1:** Laboratory Orientation & Safety Familiarization with laboratory equipment, biosafety rules, and ethical guidelines.
Week 2	**Lab 2:** Measurement of Vital Signs Measurement of heart rate, respiratory rate, body temperature, and blood pressure.

Week 3	**Lab 3:** Blood Pressure Measurement Determination of systolic and diastolic blood pressure and interpretation of results.
Week 4	**Lab 4:** Electrocardiography (ECG) Recording Recording ECG signals and identification of P, QRS, and T waves.
Week 5	**Lab 5:** ECG Analysis Calculation of heart rate, rhythm analysis, and assessment of normal ECG patterns.
Week 6	**Lab 6:** Electromyography (EMG) Recording and interpretation of skeletal muscle electrical activity.
Week 7	**Lab 7:** Reaction Time Experiment Measurement of neural reaction time and evaluation of nervous system response.
Week 8	**Lab 8:** Spirometry Measurement of lung volumes and capacities (VC, TV, IRV, ERV).
Week 9	**Lab 9:** Exercise Physiology Effect of Physical Exercise on Heart Rate and Respiratory Rate
Week 10	**Lab 10:** Pulse Oximetry Measurement of oxygen saturation and understanding the principles of optical absorption.
Week 11	**Lab 11:** Hematological Tests (Demonstration) Hemoglobin estimation and ESR measurement.
Week 12	**Lab 12:** Sensory Physiology Hearing or vision tests (Audiometry or Visual Acuity).
Week 13	**Lab 13:** Integrated Practical Session Interpretation of combined physiological data (case-based learning).
Week 14	**Lab 14:** Revision & Practical Examination Assessment of experimental skills and data analysis.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Color Atlas of Physiology, 5th edition	No
Recommended Texts	Human Physiology - Softcover	No
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required, but credit awarded
	F – Fail	راسب	(0-44)	A considerable amount of work required

Note:

NB 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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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	QUANTUM MECHANICS	**Module Delivery**	
Module Type	CORE		☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**
Module Code			
ECTS Credits	4		
SWL (hr/sem)	63		
Module Level	2	**Semester of Delivery**	4
Administering Department	Medical Physics	**College**	College of Science
Module Leader	Hassan N. Hashim	**e-mail**	hassan.hashim@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Fatimah Fadhil Abd Ali	**e-mail**	fatimahfadhil33@nahrainuniv.edu.iq
Peer Reviewer Name	N.A	**e-mail**	
Review Committee Approval		**Version Number**	

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 Aims أهداف المادة الدراسية	1. **To introduce the principles and formalism of quantum mechanics.** 2. **To develop problem-solving skills using quantum theory.** 3. **To explore the application of quantum mechanics in technology and modern physics.** 4. **To understand and discuss the philosophical implications of quantum mechanics.**		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **Demonstrate an understanding of quantum mechanical principles.** 2. **Solve quantum problems using the Schrödinger equation.** 3. **Analyze quantum systems such as particles in potential wells, oscillators, and atoms.** 4. **Discuss quantum entanglement, uncertainty, and measurement.** 5. **Apply quantum mechanics to real-world phenomena and technology (e.g., semiconductors, lasers, quantum computing).**		
Indicative Contents المحتويات الإرشادية	1. Teaching the student the basic concepts of quantum mechanics. 2. Providing the student with the skills of discussing and solving applied problems related to quantum mechanics. 3. Linking theoretical concepts with practical applications.		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	1. Discussing the topics of the methodological book and auxiliary references. 2. Theoretical lectures including problem solving and discussion of homework		

	3. Asking students for a set of thinking questions during lectures on specific topics. 4. Giving students homework that requires finding solutions on their own.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10	All
	Assignments & H.W.	1	10% (10)	2, 12	All
	Projects / Lab.	0	0%		
	Discussing During Lectures	1	10% (10)	13	All
	Seminar	1	10% (10)	12	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	9,13	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to Quantum Mechanics**
Week 2	**Mathematical Tools for Quantum Mechanics**

Week 3	**The Schrödinger Equation – Part 1**
Week 4	**The Schrödinger Equation – Part 2**
Week 5	**Quantum Superposition and Interference**
Week 6	**The Uncertainty Principle**
Week 7	**Quantum Mechanics in One Dimension**
Week 8	**Quantum Systems in Three Dimensions**
Week 9	**Quantum Mechanics of Angular Momentum**
Week 10	**Quantum Tunneling**
Week 11	**Quantum Entanglement and Nonlocality**
Week 12	**Quantum Mechanics and the Hydrogen Atom**
Week 13	**Midterm exam**
Week 14	**Quantum Statistical Mechanics**
Week 15	**Review and Final Exam Preparation**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	✓ Introduction to quantum mechanics,	https://kolegite.com/EE_library/books_and_lectures/Физика/int

	By: David J. Griffith, 3rd ed.,2018.	roduction-to-quantum-mechanics-david-j-darrell--annas-archive--libgenrs-nf-2695391.pdf
Recommended Texts	**Quantum Mechanics, by L.I. Schiff, 1949.**	
Websites	Any website related with Quantum Mechanics Subjects.	

APPENDIX:

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Sound and Waves			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code					
ECTS Credits	6				
SWL (hr/sem)	**150**				
Module Level	1		**Semester of Delivery**	2	
Administering Department	Medical Physics		**College**	College of Science	
Module Leader	Dr. Saif Mohsin Nassrullah		**e-mail**	saif.muhsin@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecture		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval	1/2/2026		**Version Number**		

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 Aims أهداف المادة الدراسية	Students will gain knowledge of wave motion and acoustics. The properties of waves will be discussed. The effect of medium on the properties of waves will be covered.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On successfully completing the module students will be able to: 1. Demonstrate knowledge and understanding of physical laws and principles, and their application to diverse areas of physics (this will include laws of motion, electromagnetism, wave phenomena and the properties of matter), with modules covering the necessary mathematics. 2- Have the understanding of the concepts of oscillatory motion, superposition of waves, sound, and electromagnetic waves. 3- Have experience with common mathematical and experimental tools including solving problems for this course. 4- Have skills in collecting and analyzing experimental data. 5. Demonstrate an ability to make use of appropriate texts, or other learning resources as part of managing their own learning.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. **1. Introduction** A brief introduction to problem-solving in physics, Physical quantities (Standards and Units), errors, uncertainty, and some math. **2. Sound** ❖ Nature and Sources of Sounds. ❖ Characteristics of Sound. ❖ Properties of Sound. ❖ Transmission of Sound **3. Wave Motion** ❖ Waves and Wave Motion.

	❖ Kinds/Types of Waves. ❖ Characteristics of Waves. ❖ Properties of Waves
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The primary approach for introducing this unit will involve fostering student engagement through active participation in homework exercises, aiming to enhance and broaden their critical thinking abilities. This will be facilitated through class sessions and interactive tutorials, supplemented by the exploration of simple experiments designed to incorporate sampling activities tailored to students' interests.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	102	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	98	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	5% (5)	2, 4, 6, 8, 10	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	8, 10	LO # 3, 4, 6 and 7
	Projects / Lab.	1	15% (10)	Continuous	
	Report	1	10% (10)	10, 11	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction
Week 2	Mechanical Waves : Characteristics of waves
Week 3	Wavelength and frequency
Week 4	Speed and energy in a traveling wave
Week 5	Standing waves
Week 6	Sound Waves: The characteristics of sound wave
Week 7	The speed of sound
Week 8	Intensity of sound waves
Week 9	Superposition of sound waves (interference and beats)
Week 10	The Doppler effect
Week 11	Oscillations and Waves
Week 11	Simple harmonic motion
Week 12	**Mid Exam**
Week 13	Harmonic motion and circular motion
Week 14	The force law and Energy in simple harmonic oscillators
Week 15	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: The decrement of decaying oscillations is defined as the ratio of successive maxima
Week 2	Lab 2: Capacitor decay constant
Week 3	Lab 3: The velocity of sound by means of resonance tube closed at one end
Week 4	Lab 4: melde's experiment
Week 5	Lab 5: The bottle resonator
Week 6	Lab 6: Optical determination of velocity of sound in liquids
Week 7	Lab 7:

Week 8	Lab 8:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Vibrations Waves and Sounds, Second Edition, 2013, ANYAEGBUNAM F.N.C.	Yes
Recommended Texts	THE PHYSICS OF VIBRATIONS AND WAVES Sixth Edition 2005,H. J. Pain Formerly of Department of Physics, Imperial College of Science and Technology, John Wiley & Sons LtdLondon, UK	Yes
Websites	file:///C:/Users/MICROSOFT/Downloads/Book5VibrationsWavesandSounds.pdf http://fizica-c-11.phys.uaic.ro/Pain%20PHYSICS%20OF%20VIBRATIONS%20AND%20WAVES%206-th%20Edition.pdf	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

NB 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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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	BIOCHEMISTRY			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☒**Lab** ☒**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code					
ECTS Credits	8				
SWL (hr/sem)	200				
Module Level	2		**Semester of Delivery**	2	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Dr. Talib Hamid Mawat		**e-mail**	Dr.talib_h@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	PhD	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval	22/1/2026		**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 Aims أهداف المادة الدراسية	1. Define learning objectives for students. 2. Emphasize essential topics and skills. 3. Motivate students by clarifying relevance. 4. Provide benchmarks to measure success. 5. Foster critical thinking and practical skill development.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge: Understanding core concepts and principles (e.g., understanding cell structure or enzyme kinetics). 2. Skills: Developing practical, analytical, and problem-solving abilities (e.g., performing biochemical experiments or analyzing protein structures). 3. Application: Applying knowledge to real-world scenarios or further studies. 4. Behavioral Competencies: Building teamwork, communication, or critical thinking skills.
Indicative Contents المحتويات الإرشادية	• principles of biochemistry, albert L. Lehninger • Harper's Illustrated Biochemistry • Medical Biochemistry…Author: John W. Baynes, Marek H. Dominiczak • Lippincott's Illustrated Reviews: Biochemistry • Principles of Medical Biochemistry…Author: Daniel H Simmons, Gerhard Meisenberg
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1.Active Learning: Engage students with group work, case studies, and discussions. 2. Visual Learning: Use diagrams, animations, and concept maps to visualize processes. 3. Technology Integration: Incorporate modeling software, simulations, and online quizzes. 4. Problem-Based Learning (PBL): Present real-world problems to encourage critical thinking. 5. Inquiry-Based Learning: Encourage students to explore and ask questions. 6. Interdisciplinary Approach: Relate biochemistry to fields like molecular biology and pharmacology. 7. Fluency-Based Approach: Have students explain concepts in their own words. 8. Formative Assessment: Use frequent quizzes and assignments for feedback.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	135	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	9

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	10% (10)	2, 5, 10, 12	LO #1, 2, 10 and 11
	Assignments	6	10% (10)	Continuous	All
	Projects / Lab.	-	-	-	-
	Report	8	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	14	LO # 1-13
	Final Exam	5hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	**The structure of cell**
Week 2	**Carbohydrate**
Week 3	**Amino acids and peptides**
Week 4	**Proteins**
Week 5	**Enzyme**
Week 6	**Lipid**
Week 7	**Nuclic acids**
Week 8	**Mid Exam**
Week 9	**Final Exam**

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Introduction to the Laboratory**
Week 2	**Safety Guidelines**
Week 3,4	**Detection of Carbohydrates**
Week 5,6	**Detection of Proteins**
Week 7,8	**Detection of Lipids**
Week 9,10	**Enzymes and Their Biological Role**
Week 11,12	**Nucleic Acids (DNA & RNA) Analysis**
Week 13	**Mid Exam**
Week 14	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	principles of biochemistry, albert L. Lehninger	YES
	Medical Biochemistry…Author: John W. Baynes, Marek H. Dominiczak	No
Recommended Texts	Harper's Illustrated Biochemistry	YES
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Medical Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	Arabic Language 2		**Module Delivery**	
Module Type	BASIC		☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	URARA2			
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level	2		**Semester of Delivery**	2
Administering Department	MPHY		**College**	College of Science
Module Leader	Omar adnan		**e-mail**	omar.adnan@nahrainuniv.edu.iq
Module Leader's Acad. Title	Assist. Professor		**Module Leader's Qualification**	Master's Degree
Module Tutor			**e-mail**	
Module Reviewer	Omar adnan		**e-mail**	omar.adnan@nahrainuniv.edu.iq
Peer Reviewer Name			**e-mail**	
Review Committee Approval			**Version Number**	

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 Aims أهداف المادة الدراسية	1. Covering the basics of the Arabic language 2. Understanding the different parts of the Arabic language 3. Developing reading, writing, and listening skills 4. Developing linguistic culture by understanding Arabic as a language with a history and culture 5. Learning speaking and conversational skills to communicate effectively with others.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowledge and understanding: Graduates must be able to know and understand the following: 2. The ability to speak and write Arabic fluently and at an advanced level. 3. An understanding of Arab culture, traditions, and values. 4. The student's ability to participate in communities and seminars, whether academically, professionally, or socially. 5. The student's ability to read and analyze literary and academic texts in Arabic, facilitating their research and writing research papers appropriately. 6. Professional readiness through the student's ability to use Arabic in translation, teaching, public relations, or any other field that requires communication in Arabic.
Indicative Contents المحتويات الإرشادية	Students should be able to understand the basic principles of the Arabic language by studying the parts of speech (nouns, verbs, and particles), defining each and explaining its meaning. Students should also be able to identify the subject and predicate, and learn their types in detail, with examples. Students should also study the verbs "kana" and its sisters, "inna" and its sisters, explaining their meanings and functions, and the changes that occur in a sentence when they are used. Students should also learn how to write numbers, punctuation marks, the closed and open taa, and other topics of interest to students learning the basics of the Arabic language.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lecture style and application with examples 2. Homework and seminar system

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	LO # 1-11
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Writing Tips (How to Write)
Week 2	Writing Topics (Our Strength in Unity)
Week 3	Writing Topics (Honoring Parents)
Week 4	Writing Topics (The Method of Moderation)
Week 5	Writing Topics (The Art of Dealing with Others)
Week 6	Mid Exam1
Week 7	Arabic Language and Its Sciences
Week 8	Communication Skills
Week 9	Imam Ali (may Allah be pleased with him) (Friends)
Week 10	Imam Ali (may Allah be pleased with him) (The Soul Weeps)
Week 11	Verb
Week 12	Mid Exam2

Week 13	Subject and Subject-Matter
Week 14	Common Spelling Mistakes
Week 15	Final Exam
Week 16	

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	New Headway Plus for Pre-intermediate	
Recommended Texts	Think Big (Required book)	
Websites	www.youtube.com	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
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Second course

Semester Six

Level Three

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Molecular Biology for Medical Physics			**Module Delivery**	
Module Type	C			**Theory** * **Lecture** * **Lab** **Tutorial** **Practical** * **Seminar**	
Module Code	MPHY3101				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	3101		**Semester of Delivery**	2	
Administering Department	1		**College**	8	
Module Leader	Maytham Abdulkahdim dragh		**e-mail**	maytham.abdulkahdim@nahrainuniv.edu.iq	
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor	Non		**e-mail**		
Peer Reviewer Name	Non		**e-mail**		
Scientific Committee Approval Date			**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		**Semester**	
Co-requisites module		**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	This module aims to provide medical physics students with a solid foundation in molecular biology, emphasizing concepts and techniques that underpin modern medical diagnostics and therapeutic applications. The course is designed to bridge the gap between physical sciences and biological systems by introducing the molecular mechanisms governing cellular function and disease. Specifically, the module aims to: • Develop an understanding of the structure and function of DNA, RNA, and proteins in normal and pathological conditions. • Introduce key molecular biology techniques used in medical physics, including PCR, electrophoresis, gene expression analysis, and molecular imaging–related concepts. • Explain the molecular basis of disease, with particular focus on cancer, genetic disorders, and radiation-induced cellular damage. • Link molecular biological processes to medical physics applications such as radiotherapy, nuclear medicine, imaging biomarkers, and personalized medicine. Enhance students' ability to interpret molecular data relevant to clinical diagnosis, treatment planning, and research in medical physics.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon successful completion of this module, students will be able to: 1. Describe the molecular structure and function of DNA, RNA, and proteins and their roles in cellular processes. 2. Explain the principles of key molecular biology techniques used in medical physics, including PCR, gel electrophoresis, and gene expression analysis. 3. Interpret molecular mechanisms underlying genetic diseases, cancer, and radiation-induced cellular damage. 4. Relate molecular biological processes to medical physics applications such as radiotherapy, nuclear medicine, and molecular imaging. 5. Analyze basic molecular biology data relevant to clinical diagnostics and biomedical research. Demonstrate awareness of the role of molecular biology in personalized medicine and modern medical technologies.
Indicative Contents المحتويات الإرشادية	1. Introduction to Molecular Biology and its relevance to Medical Physics 2. Chemical composition and structure of nucleic acids (DNA and RNA) 3. DNA replication, transcription, and translation 4. Gene regulation and epigenetic mechanisms 5. Protein structure, function, and post-translational modifications 6. Molecular basis of genetic disorders and cancer 7. Radiation–cell interactions at the molecular level (DNA damage and repair mechanisms) 8. Principles of molecular biology techniques: a. Polymerase Chain Reaction (PCR and RT-qPCR) b. Gel electrophoresis c. DNA sequencing (overview) 9. Molecular biomarkers and their role in diagnosis and prognosis 10. Introduction to molecular imaging concepts

	11. Applications of molecular biology in radiotherapy, nuclear medicine, and personalized medicine 12. Ethical and safety considerations in molecular and genetic studies

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The module will be delivered using a variety of teaching and learning strategies designed to support student understanding of molecular biology concepts within a medical physics context. These strategies include: 1. Interactive lectures to introduce and explain core molecular biology concepts. 2. Guided discussions and problem-based learning sessions to enhance critical thinking and application of knowledge. 3. Practical laboratory demonstrations and virtual simulations to illustrate molecular techniques and data interpretation. 4. Case studies linking molecular biology principles to medical physics applications such as radiotherapy and molecular imaging. 5. Use of visual aids, diagrams, and multimedia resources to simplify complex molecular processes. 6. Independent and guided self-learning through assigned readings and online resources. Continuous formative feedback to support learning progress and concept clarification.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem.) الحمل الدراسي المنتظم للطالب خلال الفصل	64	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.27
Unstructured SWL (h/sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل	61	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.06
Total SWL (h/sem.) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
As		**Time/Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10(20%)	3,8	1-5, 8-13
	Assignments	1	5(5%)		6,12
	Projects / Lab.	1	10(10%)		

	Report	1	5(5%)		1-8
Summative assessment	**Midterm Exam**	1	10(10%)		1
	Final Exam	1	50(50%)		1-15
Total assessment			100(100%)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	**Introduction to Molecular Biology** • Definition of Molecular Biology • Development of Molecular Biology and its relationship to medical sciences • Importance of Molecular Biology for Medical Physics students • Applied examples in: o Medical diagnosis o Radiation therapy o Nuclear medicine
Week 2	**Molecular Structure of Genetic Material** • Chemical structure of nucleotides • Chemical bonds in DNA and RNA • Three-dimensional organization of DNA • Molecular stability of genetic material
Week 3	**Interaction of Radiation with Genetic Material** • Types of ionizing and non-ionizing radiation • Mechanisms of radiation-induced DNA damage • Direct and indirect radiation effects • Importance in medical physics and radiation therapy
Week 4	**DNA Replication** • Mechanism of DNA replication • Enzymes involved in replication • Replication errors and genomic instability • Relationship to mutations and diseases
Week 5	**Gene Transcription** • Concept of transcription • Stages of transcription • Types of RNA • Regulation of transcription • Effects of physical factors on transcription
Week 6	**Translation and Protein Synthesis**

	• Genetic code • Mechanism of protein synthesis • Ribosomes • Mutations and their effects on protein structure and function
Week 7	• Midterm Exam + Review
Week 8	**Regulation of Gene Expression** • Gene regulation • Epigenetics • MicroRNA Radiation-induced genetic alterations
Week 9	**Cell Cycle and Checkpoints** • Phases of the cell cycle • Cell cycle checkpoints • Molecular control of cell division • Targeting the cell cycle in radiation therapy
Week 10	**Genetic Mutations** • Types of mutations • Physical and chemical causes of mutations • Radiation-induced mutations • Mutations and cancer
Week 11	**DNA Damage Repair Mechanisms** • Types of DNA damage • Molecular DNA repair systems • Repair failure and genomic instability • Clinical significance
Week 12	**Cell Death** • Apoptosis • Necrosis • Autophagy • Role of radiation in inducing cell death
Week 13	**Molecular Basis of Cancer** • Oncogenes • Tumor suppressor genes • Molecular abnormalities in cancer cells • Molecular response to radiation therapy
Week 14	**Molecular Techniques in Medicine** • PCR and Real-Time PCR • DNA sequencing • Diagnostic applications

	• Molecular biomarkers
Week 15	**Modern Applications in Medical Physics** • Molecular imaging • Radiogenomics • Personalized medicine • Comprehensive course review
Week 16	**Review + Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	**Laboratory Safety and Introduction to Molecular Technologies** **Objectives** • Understand the nature of clinical molecular laboratories • Differentiate between research and diagnostic laboratories **Lecture Management** • Biosafety levels in advanced molecular laboratories • Cross-contamination and its impact on PCR and NGS results • Introduction to basic and advanced laboratory instruments (Micropipettes, Centrifuge, Thermal Cycler, Sequencer, Flow Cytometer) **Practical Activity** • Hands-on training on micropipetting techniques • Analysis of real laboratory errors **Learning Outcome:** Students can evaluate the risk level associated with each molecular technique.
Week 2	**Buffer Preparation and Sample Quality** **Objectives** • Master laboratory calculations • Understand the importance of buffers in molecular analyses **Content** • pH and molarity concepts • Preparation of PBS and TAE/TBE buffers **Practical Activity** • Accurate preparation of laboratory buffers • Correlation between buffer quality and DNA/RNA integrity
Week 3	**Collection and Preparation of Biological Samples** **Objectives** • Identify types of clinical samples • Apply proper transport and storage conditions **Practical Activity** • Preparation of cellular samples (buccal swabs) • Discussion of contamination sources
Week 4	**DNA Extraction (Basic and Advanced Concepts)** **Objectives** • Understand DNA extraction principles and quality requirements **Content** • Cell lysis • Protein removal • DNA precipitation **Practical Activity** • Manual DNA extraction • Comparison between DNA suitable for PCR versus NGS
Week 5	**RNA Extraction and Quality Control** **Objectives**

	• Understand RNA sensitivity and stability **Content** • Differences between DNA and RNA • Concept of RNA Integrity Number (RIN) **Practical Activity** • Demonstration session • Interpretation of prepared QC datasets
Week 6	• **RNA, DNA Quantification and Purity Assessment** • **Objectives** • Interpret spectrophotometric measurements • **Practical Activity** • Measurement of A260/A280 ratios • Analysis of reasons for NGS sample rejection
Week 7	**Gel Electrophoresis** **Objectives** • Explain the principle of electrophoretic separation **Practical Activity** • Preparation of agarose gels • Analysis of DNA band patterns
Week 8	
Week 9	**PCR and Real-Time PCR** **Objectives** • Understand DNA amplification and gene expression analysis **Content** • PCR components • Thermal cycling • Real-time PCR principles **Practical Activity** • Preparation of PCR reaction mixtures • Interpretation of simulated qPCR results
Week 10	**Western Blot Analysis** **Objectives** • Analyze protein expression profiles **Content** • SDS-PAGE principles • Antibody specificity **Practical Activity** • Interpretation of Western Blot images • Correlation between protein expression and gene expression
Week 11	**Chromosome Classification, Karyotyping & Karyogram** • Classification of human chromosomes according to international standards. • Understanding the difference between a karyotype and a karyogram. • Identification of numerical and structural chromosomal abnormalities. • Knowledge of sampling methods (smears) used for the detection of chromosomal abnormalities. • Analysis of pedigree charts to determine patterns of inheritance.
Week 12	**Introduction to NGS and Whole Exome Sequencing (WES)** **Objectives** • Understand high-throughput sequencing technologies **Content** • Library preparation • Target enrichment strategies **Practical Activity** • Analysis of a real WES clinical report • Identification of pathogenic mutations
Week 13	**Introduction to NGS and Whole Exome Sequencing (WES)**
Week 14	**Flow Cytometry and Clinical Applications** **Objectives** • Analyze cellular populations in cancer and immunology **Content** • Forward and side scatter (FSC/SSC) • Gating strategies • Apoptosis markers **Practical Activity**

	• Analysis of dot plots • Clinical case study interpretation
Week 15	Final Practical Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	• NCBI (National Center for Biotechnology Information) • PubMed for biomedical literature • Online educational platforms (e.g., virtual molecular biology laboratories) • University e-learning systems and digital lecture materials	Online
Recommended Texts	• Alberts B. et al., *Molecular Biology of the Cell*, Garland Science. • Lodish H. et al., *Molecular Cell Biology*, W.H. Freeman & Company.	Online
Websites		

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.

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Medical Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	RADIOLOGICAL MEDICAL IMAGING			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code	MPHY3204				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	3		**Semester of Delivery**	2	
Administering Department	Medical physics		**College**	College of Science	
Module Leader	Dr. Sarah Abdulkareem Athari		**e-mail**	sara.abdulkareem@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Doctor		**Module Leader's Qualification**	Ph.D.	
Module Tutor					
Peer Reviewer Name	M.sc. Marwa Ahmed		**e-mail**	marwa.ahmed@nahrainuniv.edu.iq	
Review Committee Approval			**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 Aims أهداف المادة الدراسية	This module aims to equip students with:		

	1. an understanding of physical approaches from different devices used in radiological medical imaging via lectures focused on specific imaging modalities. 2.Lectures will cover various imaging techniques to provide an advanced understanding of the physics of the signal and its interaction with biological tissue; image formation or reconstruction; modality-specific issues for image quality; clinical applications; and biological effects and safety. 3. the ability to critically assess imaging techniques in terms of instrumentation, function, safety, state of the art, use, and applications. 4.To gain basic understanding to medical imaging techniques employed in modern hospitals, including x-ray imaging, computed tomography, magnetic resonance imaging, ultrasound and nuclear isotope imaging (PET).
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	LO1- Module learning outcomes for the four of the major medical imaging modalities differences: X-ray/CT – MRI- Ultrasound- Nuclear imaging/PET LO2- Also, in this module they will learn about the physics and technology behind how each of these modalities produces a medical image, as well as seeing some of the applications of these modalities. Each type of imaging has its own strengths and weaknesses, and you will learn why this is and where each modality is most useful. LO3- form the ability to identify, formulate, and adapt medical imaging solutions to unmet biological and medical needs. LO4- perceive the pre-requisites of imaging modalities and any safety considerations.
Indicative Contents المحتويات الإرشادية	-introduction Electromagnetic waves production and interaction with matters. -Introduction to ionizing radiation -Basis of medical imaging and topographic anatomy, Medical Terminology -X-ray imaging -Computed Tomography -MRI -Diagnostic ultrasound -Image quality and optimization in radiation protection
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The learning strategy depends on the following: 1. Feeding the student with theoretical foundations on Fundamentals of medical imaging and concepts from theoretical lectures. 2. Daily and semester tests. 3. Assigning cases to solve the required discussing them during the class with a practical demonstration will give students hands on experience using various imaging modalities.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	6

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150

Module Evaluation
تقييم المادة الدراسية

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (15)	3, 8,12	LO #1, 2 and 4
	Assignments	2	10% (10)	5, 12	LO # 3, 4
	Projects	1	10% (10)	Continuous	LO#, 1, 2 and 3
	Report	1	5% (5)	5-10	LO#, 1, 2 and 3
Summative assessment	Midterm Exam	3 hr	10% (10)	9	LO1,2 and 3
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	Introduction Electromagnetic waves types, production, Ionized radiation and interaction with body.
Week 2	Basis of medical imaging, topographic anatomy and Medical Terminology
Week 3	Fundamentals of X ray imaging devices, Contrast Agents and positions
Week 4	X ray clinical exams: Head and upper limbs
Week 5	X ray clinical exams: Chest, Abdomen and pelvis
Week 6	X ray clinical exams: Spines and Lower limbs
Week 7	Contrast X-ray study part I
Week 8	Contrast X-ray study Part Π
Week 9	**Mid-term exam**
Week 10	Fluoroscopy, Mammography imaging
Week 11	Computed Tomography (CT) and PET-scan imaging
Week 12	CT-scan (Native and Contrast) exams
Week 13	Nuclear- Magnetic Resonance Imaging (MRI) imaging
Week 14	Ultrasound and doppler imaging
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

Week	Material Covered
Week 1	Lab1:
Week 2	Lab 2:

Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:
Week 8	Lab 8:
Week 9	
Week 10	Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Textbook of radiographic positioning and related anatomy / Kenneth L. Bontrager, John P. Lampignano ; new photography by James C. Winters. – 8th ed. - Elsevier (2014)	Available
Recommended Texts	Clark's Positioning in Radiography / A. S. Whitley, C. Sloane, G. Hoadley, A. D. Moore, C. W. Alsop - 13th Ed - CRC Press (2016)	Available
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية
2025-2026

Module Information معلومات المادة الدراسية					
Module Title	Medical Physics			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	MPHY3202				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	3		**Semester of Delivery**	2	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Dr. Marwa abd almohsin Hassan		**e-mail**	marwa@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Zahraa Malik Mosa		**e-mail**	zahraa.malik@nahrainunive.edu.iq	
Module Reviewer	Entidhar Malik Hadi		**e-mail**	Entidhar.malik@nahrainuniv.edu.iq	
Peer Reviewer Name			**e-mail**		
Review Committee Approval	1/02/2026		**Version Number**	0.1	

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 Aims أهداف المادة الدراسية	1. **Understanding Biophysical Principles:** Focusing on the principles that link physics to medicine, such as biomechanics (statics and dynamics), pressure, and thermodynamics and their applications within the human body.		

	2. **Introducing Students to Physiological Systems from a Physics Perspective:** Such as the physics of the skeleton, the mechanics of breathing in the lungs, blood hydrodynamics in the cardiovascular system, and the electrical activity of organs. 3. **Studying Diagnostic and Therapeutic Techniques:** Understanding the scientific basis of using X-rays in bone imaging, the applications of heat and cold in medical treatment, and how to model and measure vital functions. 4. **Ability to Analyze Bio-forces and Energy:** Understanding and applying the laws of work, energy, and power specific to the human body, and analyzing internal and external forces affecting the skeleton and tissues. 5. **Developing Safety and Scientific Problem-Solving Skills:** Enhancing the ability to solve physical problems related to pressure and bio-electricity, while adhering to occupational safety standards in medical environments.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. **Analysis of Biophysical Data and Mathematical Modeling:** The ability to analyze physical data and use theoretical and mathematical models to solve complex biological problems related to the human body. 2. **Critical Thinking and Medical Problem Solving:** Learning how to use physical knowledge to analyze innovative clinical cases, such as evaluating forces on the skeleton and pressure imbalances. 3. **Interpretation of Complex Physiological Phenomena:** The ability to explain the functioning of vital systems using physical laws, such as respiratory mechanics, hemodynamics, and the electrical activity of organs. 4. **Knowledge of Practical Applications in Medicine:** Understanding the applied aspects of physics in diagnosis and treatment, such as X-ray techniques, thermal energy applications, and occupational safety standards. 5. **Understanding Fundamental Biophysical Principles:** Mastering the physical foundations governing body systems, including fluid mechanics, bio-electricity, and energy transformations within the body.
Indicative Contents المحتويات الإرشادية	**1. Biomechanics and Modeling:** • Medical terminology, body modeling, and measurement standards. • Occupational safety and radiation protection in medical settings. • Forces on and in the body: Statics, friction, and dynamics of joints. **2. Physics of the Skeletal System:** • Bone composition: Substances involved in formation and physical properties. • Fracture mechanics and the relationship between bone components and diseases. • Physical principles of X-rays and their applications in bone imaging. **3. Body Thermodynamics and Bioenergy:** • Medical applications of Heat and Cold (e.g., Thermography and

	Cryosurgery). • Metabolic energy transformations, Work, and Power of the body. • Thermal regulation mechanisms in the human body. **4. Fluid Physics and Vital Systems:** • Principles of Pressure and its vital applications (e.g., eye and brain pressure). • Physics of the Lungs: Breathing mechanics, surface tension, and gas exchange. • Physics of the cardiovascular system: Hemodynamics and blood flow dynamics. **5. Bioelectricity and Signals:** • Electricity within the body: Action potentials in nerves and muscles. • Physical basis of Electrocardiography (ECG) and Electroencephalography (EEG). • Interaction of external electricity with body tissues and electrical safety.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**1. Inquiry-Based Clinical Learning:** Encouraging students to discover physical laws by observing vital functions and questioning how the lungs or heart operate from a mechanical perspective. **2. Collaborative Learning and Simulation:** Working in small groups to analyze X-ray images or calculate forces on the skeleton, fostering the exchange of expertise in solving medical problems. **3. Brainstorming and Classroom Discussions:** Leading discussions on modern developments in medical physics and the impact of technology on diagnosis and treatment to enhance critical thinking. **4. Bio-Problem Based Learning (PBL):** Presenting students with real-world medical scenarios (e.g., blood pressure imbalances or bone fractures) and requiring solutions based on studied physical laws. **5. Continuous Formative Assessment:** Monitoring student progress through lab reports, classroom participation, and periodic quizzes to ensure conceptual understanding before advancing to complex topics.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	Midterm Exam	2 hr	10% (10)	14	LO # 1-13
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	Terminology, modeling, and measurement.
Week 2	Occupational safety.
Week 3	Forces on and in the body (statics, Frictional Forces, Dynamics).
Week 4	Physics of the skeleton.
Week 5	Study of substances involved in bone formation.
Week 6	Study the components of bones in the body and their impact on relationship to diseases.
Week 7	Bone study by X-ray.
Week 8	Mid Exam
Week 9	Heat and Cold in medicine.
Week 10	Energy, Work and Power of the body.
Week 11	Pressure.
Week 12	The physics of the Lungs and breathing.
Week 13	Physics of the Cardiovascular system.
Week 14	Electricity within the body.
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

Week	Material Covered
Week 1	Lab 1:

Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Medical Physics | John R. Cameron & James G. Skofronick	No
Recommended Texts	Physics of the Human Body | Irving P. Herman (Springer)	No
Websites	https://books.google.iq/books?id=vtubxNaSAdAC&lpg=PR1&pg=PA10#v=onepage&q&f=false	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
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ملاحظة: هذا النموذج تم وضعه وتقديمه من قبل مديرية ضمان الجودة في وزارة التعليم العالي والبحث العلمي

	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Department of Medical Physics	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Nano Materials			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	MPHY3106				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	3		**Semester of Delivery**	2	
Administering Department	MPHY		**College**	College of Science	
Module Leader	Alaa Jabbar Ghazai		**e-mail**	dr.alaa.ghazai@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	PhD	
Module Tutor	Rafah Mohammed		**e-mail**	rafah.m.h@nahrainuniv.edu.iq	
Module Reviewer			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 Aims أهداف المادة الدراسية	1. Introducing students to the basic concepts of nanotechnology and its scientific and technological importance. 2. Developing the ability to understand the unique physical and chemical properties of materials at the nanoscale. 3. Studying various methods for synthesis and fabrication of		

	nanomaterials. 4. Enabling students to understand modern techniques used for characterization of nanomaterials. 5. Familiarizing students with advanced applications of nanomaterials in fields such as medicine, electronics, energy, and environment. 6. Linking theoretical principles with practical applications in physics, engineering, and medical sciences. 7. Encouraging students to engage in independent learning and research in the field of nanotechnology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Analyze the fundamental differences between the properties of bulk materials and nanoscale materials. 2. Understand and explain nanoscale physical phenomena such as quantum confinement, surface effects, and size-dependent properties. 3. Describe various methods of nanomaterial synthesis including: Chemical vapor deposition, Sol–gel techniques, Mechanical milling, Physical and chemical fabrication methods
Indicative Contents المحتويات الإرشادية	1. Classification and Selection of Materials 2. Atomic Structure, and Electronic Configuration 3. Crystal Geometry, Structure and Defects 4. Bonds in Solids 5. Electron Theory of Metals 6. Photoelectric Effect 7. Diffusion in Solids 8. Mechanical Properties of Materials and Mechanical Tests 9. Deformation of Materials
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Inquiry-based learning: Encourages students to ask questions and discover concepts on their own through experiments and research projects, which enhances critical thinking and problem-solving skills. 2. Collaborative learning: Encouraging teamwork where students exchange ideas and collaborate in solving scientific questions and experiments. 3. Brainstorming and group discussion: This strategy helps to promote group thinking and the cultural exchange of scientific ideas among students. 4. Problem-based learning: Students learn physics by facing real issues and solving those using physics tools and concepts. 5. Constructive assessment: Using continuous assessment to measure students' progress and understanding of concepts, rather than relying solely on final exams.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13

Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125

Module Evaluation
تقييم المادة الدراسية

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	Continuous	All
	Online Assignments	1	10% (10)	Continuous	All
	Onsite Assignments	1	10% (10)	Continuous	All
	Seminar	1	10% (10)	Continuous	All
Summative assessment	Midterm Exam	2 hr	10% (10)	14	LO # 1-13
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	Classification and Selection of Materials
Week 2	Atomic Structure
Week 3	Electronic Configuration
Week 4	Crystal Geometry
Week 5	Structure and Defects
Week 6	Bonds in Solids
Week 7	Electron Theory of Metals
Week 8	Photoelectric Effect
Week 9	Diffusion in Solids
Week 10	Mechanical Properties of Materials
Week 11	Mechanical Tests
Week 12	Deformation of Materials
Week 13	Deformation of Materials
Week 14	Mid Exam
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

Week	Material Covered

Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	MATERIAL SCIENCE, S. L. KAKANI and AMIT KAKANI, 2004, New Age International (P) Ltd., Publishers	No
Recommended Texts		
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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	وزارة التعليم العالي و البحث العلمي – العراق جامعة النهرين كلية العلوم قسم الفيزياء الطبية	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**PROFESSIONAL ETHICS**			**Module Delivery**	
Module Type	CORE			☒**Theory** ☒**Lecture** ☐**Lab** ☒**Tutorial** ☐**Practical** ☒**Seminar**	
Module Code	MPHY				
ECTS Credits	2				
SWL (hr/sem)					
Module Level	3		**Semester of Delivery**	5	
Administering Department	Medical Physics		**College**	College of Science	
Module Leader	Hassan N. Hashim		**e-mail**	hassan.hashim@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**Version Number**		

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 Aims أهداف المادة الدراسية	1. Teach students the principles of professional ethics. 2. Providing students with the ability and experience to solve situations facing the medical technologist in his profession. 3. Finding the relationship between the individual's education and the legacies of society in the medical field from an ethical point of view.		

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Enable students to know the basics of professional ethics. 2. Enable students to understand the applied aspects of professional ethics.
Indicative Contents المحتويات الإرشادية	1. Teach the student the basic concepts of professional ethics. 2. Provide the student with the skills to discuss and solve applied problems related to professional ethics. 3. Linking theoretical concepts to practical applications through real-life examples.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Discussion of the topics of the textbook and auxiliary references. 2. Theoretical lectures that include problem solving and discussing homework. 3. Asking students to ask a set of intellectual questions during lectures on specific topics. 4. Give students homework assignments that require finding solutions on their own.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
As		**Time/Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	All
	Online Assignments	1	10% (10)	2, 12	All
	Onside Assignments	0	0%		
	Seminar	1	10% (10)	13	All
Summative assessment	**Midterm Exam**	2 hr	20% (20)	9,13	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	**Unit 1 (Introduction to Professional Ethics)**

	The Concept and Origin of Ethics, General Rules of Ethics
Week 2	Sources of Ethics, Ethical Values, and the Importance of Ethics for the Individual and the Collective
Week 3	**Unit 2 (work and profession)** **Work and its importance, work behaviors, the concept of the profession, the definition of the profession, the difference between the concept of work, profession and craft, the standards on which the profession must be based.**
Week 4	**Unit 3 (Ethics of the Profession) is what is the Ethics of the Profession, the Positive Returns of Commitment to Ethics, the Characteristics of Work Ethics, the Qualities of Professional Ethics, the Steps of Level and Acceptance of Professional Ethics**
Week 5	**Unit 4 (Values and Professional Ethics) Honesty, Honesty, Advice**
Week 6	Justice, good dealing, mastery at work
Week 7	**Unit 5 (Patterns of Unethical Behavior in the Profession)** **Administrative Corruption: Unethical Administrative Behavior, Definition of Administrative Corruption, Types of Administrative Corruption**
Week 8	Bribery: The concept of bribery, the types of bribery, the difference between a gift and a bribe, the reasons and motives behind bribery. Cheating: The concept of cheating, the nature of cheating at work, the manifestations of cheating in the performance of the job
Week 9	**Unit 6 (Means and Methods of Consolidating the Values of Professional Ethics) The method of consolidating professional ethics, the levels of building and consolidating professional ethics, the means and methods of consolidating professional ethics, Things to consider in drafting the ethical code for the profession, how ethical behavior is promoted at work.**
Week 10	**Mid-term Test**
Week 11	**Unit 7 (Ethics of the Practice of Medical Professions (Health and Medical Technical Specialties) Characteristics and Qualities of the Medical Technician, Duties of the Medical Technician Towards (His Profession, Patient, Society)**
Week 12	**Patient's Rights** - Justice and Equality - Keeping patient information confidentially - Maintaining patient privacy - Informed consent Comprehensive Care - Putting the patient's interest before all considerations - Patient Communication - Effective Communication Rights to health records
Week 13	**The relationship of the medical technologist with the community and his responsibility towards the environment and public safety by adhering to the basic rules of the profession to prevent the spread of epidemics and diseases, as well as the importance of his role in spreading health awareness and ways to prevent the spread of diseases.**
Week 14	**Professional Relationship: The relationship of the medical technologist with his colleagues in the health institution (respect, cooperation, avoidance of criticism in front of patients, accuracy and honesty in evaluating performance)** **Ethics and Medical Research: Ethics of conducting medical experiments in Iraqi health institutions. Helsinki Convention on the Ethics of Medical Experiments. Ethics of teaching and learning on patients.**
Week 15	**Preparatory Week (Curriculum Review)**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**

Week 1	Lab 1:
Week 2	Lab 2:
Week 3	Lab 3:
Week 4	Lab 4:
Week 5	Lab 5:
Week 6	Lab 6:
Week 7	Lab 7:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	أخلاقيات المهنةProfessional Ethics اعداد أ.م.د. كريم عبد ساجر ، أ.م.د. رغد حسن حسين ، م.د. خلود عبدالامير الجامعة التقنية الوسطى / وزارة التعليم العالي والبحث العلمي (2019)	https://ntu.edu.iq/wp-content/uploads/2024/10/%D9%85%D9%84%D8%B2%D9%85%D8%A9-%D8%A7%D8%AE%D9%84%D8%A7%D9%82%D9%8A%D8%A7%D8%AA-%D8%A7%D9%84%D9%85%D9%87%D9%86%D8%A9-%D9%84%D9%84%D9%85%D8%B9%D8%A7%D9%87%D8%AF.pdf
Recommended Texts		
Websites	Any website that includes a course of professional ethics	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:				

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	Ministry of Higher Education and Scientific Research - Iraq Al-Nahrain University College of Science Physics Department	

MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Diagnostic Radiology Physics**			**Module Delivery**	
Module Type	CORE			☒**Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☒**Practical** ☒**Seminar**	
Module Code					
ECTS Credits	5				
SWL (hr/sem)					
Module Level	3		**Semester of Delivery**	1	
Administering Department	Medical physics		**College**	College of Science	
Module Leader	Dr. Ahmed H. Flayyih		**e-mail**	ahmed.hmood@nahrainuniv.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Review Committee Approval			**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 Aims أهداف المادة الدراسية	The primary aim of Diagnostic Radiology Physics is to ensure the highest quality medical images are produced for accurate diagnosis while keeping patient and staff radiation doses as low as reasonably achievable. It bridges technical, safety, and clinical needs through quality control, equipment calibration, and radiation protection. Key objectives of Diagnostic Radiology Physics include: Interaction Light with Matter, Dosimetry, X ray Production, Computed Tomography, ultrasound physics, Magnetic Resonance
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Diagnostic Radiology Physics module learning outcomes focus on enabling students to understand, apply, and evaluate the physical principles, equipment, and safety regulations underpinning medical imaging. Key outcomes include mastering X-ray production and interaction with matter, performing quality assurance on imaging equipment (CT, radiography, fluoroscopy), identifying image artifacts, and implementing radiation protection measures for patients and staff.
Indicative Contents المحتويات الإرشادية	**Chapter one: Fundamental of Atomic and Nuclear Physics** *Electromagnetic radiation* *Electrons and photons* *Nuclear particles* *Atomic structure* *Bohr mode* *Exaction and ionization atoms* *The production of characteristic X-rays and Auger electrons* *Radiation from an accelerated charge, bremsstrahlung* **Chapter Two: Interaction Light with Matter** *Interactions of photons with matter* *Photoelectric Effect* *Thomson scattering* *Coherent (Rayleigh) scattering* *Compton scattering by free electrons* *Scattering and energy transfer coefficients* *Incoherent scattering* *Linear attenuation coefficient* *Exponential attenuation* *Mass attenuation coefficient* *Mass energy transfer coefficients and mass energy absorption coefficients* *Stopping power.* **Chapter three: Fundamentals of Dosimetry** *Quantities and Units* *Radiation fields: Fluence and energy fluence* *Energy transferred, net energy transferred, energy imparted* *Kerma and Collision Kerma* *Kerma for photons* *Absorbed dose* *Kerma and absorbed dose* *Charged Particle Equilibrium in Dosimetry* **Chapter: Fundamentals of X ray Production** *Bremsstrahlung*

	Characteristic radiation *X- ray spectrum* *X- ray Tubes* *Components of the X ray tube (Cathode and Anode)* *Energizing and Controlling the X ray Tube Filament circuit* *Generating the tube voltage* *Exposure timing* **Chapter Five: Computed Tomography (CT)** Principles of CT Hounsfield units The CT Imaging System Different Modes of CT Acquisitions CT Image Quality **Chapter six : Physics of ultrasound** Physical properties of Ultrasound wave One dimensional ultrasonic waves Acoustic pressure and intensity Reflection and transmission Ultrasound Attenuation Ultrasonic Properties of Biological Tissue Ultrasonic Transduction (Piezoelectric devices, Transmitted pulse, Radiation and diffraction) Doppler Physics (The Doppler effect, Continuous wave Doppler, Pulsed wave Doppler) Biological Effects of Ultrasound (Bioeffects mechanisms, Acoustic output metrics, Patient safety considerations) Ultrasound Imaging **Chapter seven: Physics of Magnetic Resonance** Introduction The nucleus: Spin, angular and magnetic momentum External magnetic field and magnetization Excitation and detection Relaxation and tissue contrast Spatial encoding and basic pulse sequences
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**The Learning Strategies & Teaching** • **Retrieval Practice:** Actively recalling information from memory (e.g., flashcards, quizzes) strengthens neural paths, making it better than passive reading. • **Spaced Repetition:** Reviewing material over increasing intervals of time rather than cramming, which helps move information into long-term memory. • **Elaboration:** Explaining and describing ideas in detail, connecting new information to existing knowledge to create deeper understanding. • **Dual Coding:** Combining verbal and visual representations (e.g., drawing diagrams, using infographics) to enhance memory. • **Interleaving:** Mixing up different topics or subjects in one study session to improve discrimination and problem-solving skills. • **Metacognition:** Monitoring, planning, and evaluating one's own learning process to understand how to study more effectively.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل			

Module Evaluation
تقييم المادة الدراسية

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (15)	3, 6, 8	LO #1,
	Assignments	2	10% (10)	5, 12	LO # 3, 4
	Seminar		15% (15)	Continuous	LO#, 1, 2 AND 3
	Report	-------	----------	-	
Summative assessment	**Midterm Exam**	3 hr	10% (10)	10	LO#,3
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	**<u>Chapter one: Fundamental of Atomic and Nuclear Physics</u>** *Electromagnetic radiation* *Electrons and photons* *Nuclear particles* *Atomic structure* *Bohr mode* *Exaction and ionization atoms* *The production of characteristic X-rays and Auger electrons* *Radiation from an accelerated charge, bremsstrahlung*
Week 2	**<u>Chapter Two: Interaction Light with Matter</u>** *Interactions of photons with matter* *Photoelectric Effect* *Thomson scattering*

	Coherent (Rayleigh) scattering *Compton scattering by free electrons* *Scattering and energy transfer coefficients* *Incoherent scattering* *Linear attenuation coefficient* *Exponential attenuation* *Mass attenuation coefficient* *Mass energy transfer coefficients and mass energy absorption coefficients* *Stopping power.*
Week 3	**Chapter three: Fundamentals of Dosimetry** *Quantities and Units* *Radiation fields: Fluence and energy fluence* *Energy transferred, net energy transferred, energy imparted* *Kerma and Collision Kerma*
Week 4	*Kerma for photons* *Absorbed dose* *Kerma and absorbed dose* *Charged Particle Equilibrium in Dosimetry*
Week 5	**Chapter Four: Fundamentals of X ray Production** *Bremsstrahlung* *Characteristic radiation* *X- ray spectrum* *X- ray Tubes*
Week 6	*Components of the X ray tube (Cathode and Anode)* *Energizing and Controlling the X ray Tube Filament circuit* *Generating the tube voltage* *Exposure timing*
Week 7	**Chapter Five: Computed Tomography (CT)** Principles of CT Hounsfield units The CT Imaging System
Week 8	Different Modes of CT Acquisitions CT Image Quality
Week 9	**Chapter six : Physics of ultrasound** Physical properties of Ultrasound wave One dimensional ultrasonic waves Acoustic pressure and intensity Reflection and transmission
Week 10	**Mid-term exam**
Week 11	Ultrasound Attenuation Ultrasonic Properties of Biological Tissue Ultrasonic Transduction (Piezoelectric devices, Transmitted pulse, Radiation and diffraction)
Week 12	Doppler Physics (The Doppler effect, Continuous wave Doppler, Pulsed wave Doppler) Biological Effects of Ultrasound (Bioeffects mechanisms, Acoustic output metrics, Patient safety considerations) Ultrasound Imaging
Week 13	**Chapter seven: Physics of Magnetic Resonance** Introduction The nucleus: Spin, angular and magnetic momentum External magnetic field and magnetization
Week 14	Excitation and detection Relaxation and tissue contrast Spatial encoding and basic pulse sequences
Week 15	**Preparatory Week**
Week 16	**Final Exam**

Delivery Plan (Weekly Practical) المنهاج الاسبوعي العملي	
Week	**Material Covered**
Week 1	General Introduction
Week 2	Practical Field Work (x-ray)
Week 3	Report
Week 4	Practical Field Work (CT SCAN)
Week 5	Report
Week 6	Practical Field Work (MEMOGRAPHY)
Week 7	Report
Week 8	Practical Field Work (Ultrasound)
Week 9	Report
Week 10	Practical Field Work (Ultrasound)
Week 11	Report
Week 12	Practical Field Work (Magnetic Resonance device)
Week 13	Report
Week 14	EXAM
Week 15	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Diagnostic Radiology Physics: A Handbook for Teachers and Students D.R. Dance and et. al International atomic energy agency Vienna, 2014	Available
Recommended Texts	Fundamentals of Medical Physics: Principles and Applications Ruqaya Jalal Kamel	Available
Websites	https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1564webNew-74666420.pdf	

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