MODULE DESCRIPTION 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	**PHY-232**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	2		**Semester of Delivery**	4	
Administering Department	Physics		**College**	Science	
Module Leader	د.ندى		**e-mail**	الايميل@uodiyala.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	MS.C	
Module Tutor	Zaid Abdulhadi Abed		**e-mail**	zaidabdulhadi@uodiyala.edu.iq	
Peer Reviewer Name	ست زينب		**e-mail**	الايميل	
Scientific Committee Approval Date	18/06/2024		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	231	**Semester**	3
Co-requisites module	Non	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	Modern physics refers to physics developed in the 20th century including the special theory of relativity, quantum mechanics, atomic and nuclear physics, particle physics and cosmology. While classical physics is generally concerned with matter and energy on the normal scale of observation, much of modern physics is concerned with the behavior of matter and energy under extreme conditions or on the very large (the universe) or very small (sub-atomic level) scale.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the Schrödinger equation for hydrogen atom 2. Give the knowledge of the separation variables for Schrödinger equation. 3. Understanding the meaning of the quantum numbers of the hydrogen atom and then generalizing it for atoms has more electrons. 4. Explain how the quantum numbers play rules in Zeeman effect and electronic spectrum. 5. Give knowledge about the molecular depending on the formation motion and bands. 6. Give the principles of the Statical mechanics (Maxwell-Boltzmann Distribution and Fermi – Dirac Distribution) 7. Provide the information of the solid state physics 8. give a wide vision about the nuclear physics (form, size, radius and the mass of nucleus in addition to nuclear models)
Indicative Contents المحتويات الإرشادية	Indicative content includes the following:
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 ability modern physics and the relationship with real-life problem. Students understand the basic concepts, analytic skills and numeracy skills. Students also practice to

	explain and analyze the natural phenomena and technology both qualitatively and quantitatively that exist in the environment by using basic physics concepts and apply it to everyday life.

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	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
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)	4 and 10	LO #1, #2, #3 and #4, #5, #6, #7, #8
	Assignments	2	10% (10)	5 and 12	LO #1, #2, #3 and #4, #5, #6, #7, #8
	Project	1	10% (10)	Continuous	All
	Report	1	10% (10)	14	LO #1, #2, #3 and #4,

					#5, #6, #7, #8
Summative assessment	**Midterm Exam**	2hr	10% (10)	8	LO #1 - #6
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
Week assignment	**Material Covered**
Week 1	**Chapter One: Quantum Mechanics for Hydrogen Atom** Schrodinger equation for hydrogen atom, separation of variables and Quantum numbers
Week 2	Principal quantum number, orbital quantum number and Magnetic Quantum Number
Week 3	Electronic orbits, Zeeman phenomenon and selection roles
Week 4	**Chapter two: Molecular Physics** Molecular formation, hybrid orbits and carbon-carbon bonds
Week 5	Rotational energy levels, vibrational energy levels and molecular electronic spectra
Week 6	**Chapter three: Statistical Mechanics** Statistical distribution lows, phase space and Maxwell-Boltzmann distribution
Week 7	**Midterm Exam**
Week 8	Constants Evaluation, black – body radiation, Fermi – Dirac distribution and Laser ray

Week 9	Uncertainty principles, applications of uncertainty principles, the wave-particles duality and Alpha Particle
Week 10	**Chapter four: Solid State Physics** Crystalline and Amorphous Materials and Ionics Crystals
Week 11	Covalent crystals, Van Der Waals forces, metallic Bond
Week 12	Band theory of solid materials, Fermi energy, electrons-energy distribution
Week 13	**Chapter five: Nuclear Physics** Atomic masses, neutrons and stable nuclei
Week 14	Nuclear Size, Shapes and Spectra
Week 15	Binding energy, deuterons and nuclear models

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week assignment	**Material Covered**
Week 1	Photoelectric experiment
Week 2	Ballmer series experiment
Week 3	Electron diffraction experiment
Week 4	Midterm exam
Week 5	Maltese cross experiment
Week 6	Determination of $\frac{e}{m}$ (Schuster method)
Week 7	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Arthur Beiser (2003). Concepts of modern Physics. McGraw companies, New York , USA.	Yes
Recommended Texts	R.B. Singh (2009). Introduction to Modern Physics. NEW AGE INTERNATIONAL (P) LIMITED, PUBLISHERS 4835/24, Ansari Road, Daryaganj, New Delhi - 110002	No
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.