	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

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.