MODULE DESCRIPTOR FORM

Module Information					
Module Title	ATOMIC PHYSICS			**Module Delivery**	
Module Type	CORE			**Theory ✓** **Lab ✓** **Tutorial ✓**	
Module Code	MPH2204				
ECTS Credits	8 ECTS				
SWL (hr/sem)	200				
Module Level	2		**Semester of Delivery**	2	
Administering Department	MPH		**College**	College of Sciences	
Module Leader	Hikmat Adnan Jwad		**e-mail**	Hikmat.a@uowa.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Hikmat Adnan Jwad		**e-mail**	Hikmat.a@uowa.edu.iq	
Peer Reviewer name	Hikmat Adnan Jwad		**e-mail**	Hikmat.a@uowa.edu.iq	
Review Committee Approval	2025-01-20		**Version Number**	1.0	

Relation With Other Modules			
Prerequisite module	None	**Semester**	None
Co-requisites module	None	**Semester**	None

Department Head Approval

Dean of the College Approval

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	.1 Learn about general concepts about the atom and the laws that govern it. .2 Identify models describing atomic structure and the components of the atom .3 Know how to determine the quantum numbers of electrons in an atom. .4 Learn about the theory of perturbations in atomic levels. .5 Study the absorption and emission of atom levels and identify spontaneous emissions .6 Study of permitted and prohibited transitions between atomic levels. .7 Study the effect of electric and magnetic fields on atomic levels and learn about the phenomenon of the Zeeman and Stark effect. .8 Study of the connection between the spin and spin of the electron and the associated interactions.
Module Learning Outcomes	.1 Developing students' skills in logical thinking and analysis .2 Enabling students to confront the fear of presenting in front of the public by presenting them with seminars related to the subject of atomic physics over the first semester in the form of groups. .3 Make students able to search for good and valuable information by asking them to do homework related to the subject. .4 Make student knowledgeable about atomic physics topics .5 Make the student able to use scientific sources by explaining to him how to obtain information from reliable sources. .6 Developing student thinking and linking information through lectures, explanatory videos, and ways to use information from respected academic sources and express it in different ways. .7 Make the student able to create an environment of understanding and familiarity with his colleagues through awareness campaigns .8 Maximizing the Creator's ability in the presence of natural and scientific phenomena.
Indicative Contents	<u>Theory Lectures</u> Learning concepts of each theoretical lecture or groups of lectures. [SSWL= 28] <u>Lab. Lectures</u> Learning concepts of each laboratory lecture or groups of lectures. [SSWL= 30] Total hrs = ∑SSWL + (Mid Exam hrs+ Final Exam hrs) Total hrs = 28 +30 + 1 +3 = 62

Learning and Teaching Strategies	
Strategies	-1 Lecture -2 Problem-based learning (PBL) -3 Peer teaching and collaborative learning -4 Reflective practice -5 Workshops

	Laboratory sessions -6 Student groups. -7 Discussion. -8 Giving students assignments to solve problems. -9 Assigning students to prepare reports related to the course. -10

Student Workload (SWL)			
Structured SWL (h/sem)	75	**Structured SWL (h/w)**	5
Unstructured SWL (h/sem)	122	**Unstructured SWL (h/w)**	8.133
Total SWL (h/sem)	197 + 3 final = 200		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10%(10)	3,6,9	3,6
	Project	1	10%(8)	All Weeks	1-8
	Lab	3	10% (7)	All Weeks	2,5,7
	Home Work	2	10% (7)	All Weeks	4,8
	Report	2	10%(8)	All Weeks	7,8
Summative assessment	**Midterm Exam**	1	10% (10)	7	
	Final Exam	1	50% (50)	16	
Total assessment			100%		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to atomic physics.
Week 2	Quantum mechanical description of the hydrogen atom Angular Momentum Atomic Spectra Time.
Week 3	Independent Perturbation Theory Fine Structure.
Week 4	Spin Orbit Coupling
Week 5	Relativistic Effects
Week 6	Time-Dependent Perturbation Theory Interaction of Atoms with E. M. Radiation
Week 7	Mid. Exam
Week 8	Absorption and Emission of Radiation
Week 9	Allowed and Forbidden Transitions
Week 10	Spontaneous Emission Many Electron Atoms
Week 11	Atoms in Magnetic Field and Stark effect
Week 12	Zeeman Effect, Weak-Field Zeeman Effect and Strong field Zeeman effect
Week 13	Hund's Rules and Atomic Orbitals
Week 14	Spin Orbit Interactions, LS-coupling approximation and jj-coupling approximation
Week 15	Selection Rules Atoms in Electric or Magnetic Fields

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	X-ray physics Attenuation of x-rays
Week 2	Determination of the specific charge of the electron.
Week 3	Diffraction of electrons in a polycrystalline lattice
Week 4	Study the spectrum of mercury atom.
Week 5	Plank's Constant
Week 6	Stefan-Boltzmann's Law
Week 7	Investigation Ballmer series / Determination of Rydberg's constant.
Week 8	Heisenberg's uncertainty principle
Week 9	Frank-Hertz experiment with Neon
Week 10	Diffraction of electrons in a polycrystalline lattice
Week 11	Study the spectrum of mercury atom.
Week 12	Plank's Constant
Week 13	Stefan-Boltzmann's Law
Week 14	Investigation Ballmer series / Determination of Rydberg's constant.
Week 15	Heisenberg's uncertainty principle

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Atomic Physics 2010, Massachusetts, Wesley	No
Recommended Texts	1. Bransden and Joachain, Physics of Atoms and Molecules, Longman scientific and technical, 1983 2.Ewart, P. (2019). Atomic physics. Morgan & Claypool Publishers.	No
Websites	https://www.britannica.com/Science-Tech https://www.sciencedirect.com/	

APPENDIX:

GRADING SCHEME				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	Excellent	90 - 100	Outstanding Performance
	B - Very Good	Very Good	80 - 89	Above average with some errors
	C - Good	Good	70 - 79	Sound work with notable errors
	D - Satisfactory	Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	Fail	(45-49)	More work required but credit awarded
	F – Fail	Fail	(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.