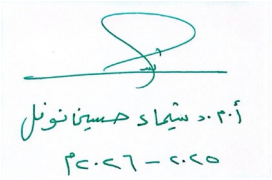
MODULE DESCRIPTION FORM

Module Information					
Module Title	Basics of Laser			**Module Delivery**	
Module Type	Core			☒Lecture	
Module Code	MP305			☒Practical	
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	UG III	**Semester of Delivery**	1		
Administering Department	Medical physics	**College**	College of Science		
Module Leader	Mohammad Jawad Kareem	**e-mail**	mohammad.Jawad@uowa.edu.iq		
Module Leader's Acad. Title	Asist. Prof. Dr.	**Module Leader's Qualification**	Ph.D		
Module Tutor	Musaab Khudhur Mohammed	**e-mail**	musab.k.m@uowa.edu.iq		
Peer Reviewer Name	Dr. Ahmed Mousa Jaafar	**e-mail**	Ahmed.mo@uowa.edu.iq		
Scientific Committee Approval Date	1 – 9 - 2025	**Version Number**	1.0		

Relation with other Modules			
Prerequisite module	Basics of Laser	**Semester**	1
Co-requisites module	Medical Laser Applications	**Semester**	2



Department Head Approval

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Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	1 - Description of the origin of the physical processes in laser systems. 2-Explanation of physics concepts for gain and amplification in different lasers 3–Explanation of the concepts of generation short pulses in laser devices 4 - using mathematical equations to calculate different physical parameters of laser systems
Module Learning Outcomes	1. Define the meaning of laser. 2. Develop a clear understanding of basic physical phenomena in thermal physics and materials science as an integral part of the student's overall education 3. Explain natural phenomena using simple physics concepts. 4. Compare between laser and other sources of light. 5. Calculate and find the ratio of atoms population in the energy levels. 6. Use algebra, trigonometry, and basic calculus, in solving problems in Laser physics and Laser cavity 7. Provide detailed and accurate description of ABCD ray tracing in an optical cavity 8. Classify the laser types according to active medium materials. 9. List and give details of different applications of laser
Indicative Contents	Indicative content includes the following. Part A – light principle Basic of light phenomena, the electromagnetic radiation theory and equations, the properties of photon, laser definition, laser hazard, safety of laser and classification of laser [15 hrs] Part B- Laser Properties Laser history, coherence light, directionality of light, monochromatic light, brightness, interaction of radiation with atom, normal population, population inversion, laser levels, Einstein relation, laser elements, laser cavity, the modes inside the cavity, types of cavity, stability of laser resonators, laser gain and laser losses, continues wave laser (CW), pulsed laser operation, laser spikes, Q-switched mode and modes locking, propagation of Gaussian profile. [30 hrs]. Part C- laser types: Gas laser, He-Ne laser, CO2 laser, Argon ion laser, Solid state laser, ruby laser,

	Nd:YAG laser, liquid laser, dye laser, semiconductors laser. [10 hrs] Part D- Laser applications: Laser matter interaction, absorption of laser radiations, thermal effect, laser vaporization and plasma formation, laser ablation, scientific application, Hologram, industrial application, drilling and cutting, communication application, laser in military

Learning and Teaching Strategies	
Strategies	This course will be delivered through a combination between theoretical lectures in the classroom and experimental lectures in the Lab. The students will be receiving the outcome of each lecture through discussions; videos related to the subject and questions. In addition, the information will be developed by self-learning through reading and searching to hand in the essay and home works.

Student Workload (SWL)			
Structured SWL (h/sem)	78	**Structured SWL (h/w)**	5.2
Unstructured SWL (h/sem)	72	**Unstructured SWL (h/w)**	4.8
Total SWL (h/sem)	150		

Module Evaluation								
		Time/Number		Weight (Marks)		Week Due	Relevant Learning Outcome
		TH	LAB	TH	LAB		
Formative assessment	Quizzes	2	2	4	10	3,6,8,11	1-2,4-5,6-7,9-10
	Outsite assignment	1	1	2	10	2,3,5,6,7	1,2,3,4,5,6
	Insite Assignments	-	-	-	-	-	-
	Projects	1	6	4	10	-	All
Summative assessment	Midterm Exam	1hr		10		7	1-6
	Final Exam	3hr		50		16	All
Total assessment				100 (100 Marks)			

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Properties of light
Week 2	Laser properties
Week 3	Interaction of radiation with atoms
Week 4	Population inversion of atoms
Week 5	Laser levels, three level laser and four level lasers.
Week 6	Elements of laser.
Week 7	Midterm exam
Week 8	Lasing action
Week 9	Laser cavity
Week 10	Modes of the resonators
Week 11	Laser gain
Week 12	Laser operation
Week 13	The properties and propagations of Gaussian beam
Week 14	Laser types
Week 15	Laser applications
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Introduction to laser lab.
Week 2	diffraction from single slit.
Week 3	
Week 4	measuring the diameter of human hair by laser diffraction
Week 5	
Week 6	
Week 7	determination of wavelength of laser light by using diffraction grating.
Week 8	
Week 9	Laser beam divergence
Week 10	
Week 11	laser spot size
Week 12	
Week 13	laser spot size Measurement of the absorption coefficient of material By Using Laser light
Week 14	
Week 15	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Laser Principles, Types & Applications: K R Nambiar, New Age International, 2004	No
Recommended Texts	Lasers: Theory and Applications : A K Ghatak and K Thyagarajan, McMillan, 2003	No

Grading Scheme				
Group	**Grade**	**Mark**	**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	Fair / Average	60 - 69	Fair but with major shortcomings
	E - Sufficient	Pass / Acceptable	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	FX – Fail	Fail (Pending)	(45-49)	More work required but credit awarded
	F – Fail	Fail	(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.