

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Medical Laser Systems		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	MIET4102		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	UG IV	Semester of Delivery	
Administering Department	MIET	College	EETC
Module Leader	MS.c. Sajdeen K. Dawood	e-mail	Sajdeen.k@s.uokerbala.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor	MS.c. Sajdeen K. Dawood	e-mail	Sajdeen.k@s.uokerbala.edu.iq
Peer Reviewer Name	MS.c. Sajdeen K. Dawood	e-mail	Sajdeen.k@s.uokerbala.edu.iq
Scientific Committee Approval Date	22/3/2026	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Anatomy and Physiology_ MIET2105	Semester	UGII- S3
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 nature of light and laser generation, including the introduction of the electromagnetic spectrum, absorption, and emission processes. 2. Familiarize with laser levels systems and the properties of laser light. 3. Gain knowledge of laser system design, including the active medium, pumping sources, and optical resonators. 4. Comprehend medical laser delivery systems. 5. Identify different types of laser systems and their properties. 6. Learn about laser detectors, including quantum detectors, vacuum photodiodes, and photomultipliers. 7. Explore the interaction between laser radiation and biological tissue. 8. Understand the various mechanisms of laser-tissue interaction. 9. Categorize laser medical applications based on the type of laser, type of treatment, and the targeted organ. 10. Examine laser medical applications in surgery, dermatology, ophthalmology, dentistry, oncology, and urology. 11. Understand laser hazards and the classification of laser hazards based on intensity. 12. Learn about the standard levels for ensuring safe working environments in laser-related settings.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the principles of medical laser applications. 2. Explain absorption and emission processes in laser systems. 3. Grasp the energy levels in laser systems and their role in laser emission. 4. Describe the unique properties of laser light. 5. Gain knowledge of different types of medical lasers and their specific applications in various medical fields. 6. Identify the benefits and limitations of using lasers in medical procedures. 7. Develop an understanding of laser-tissue interaction and the mechanisms behind the therapeutic effects of laser treatments. 8. Acquire practical skills in the operation, calibration, and maintenance of medical laser equipment. 9. Apply critical thinking and problem-solving skills to assess patient suitability for laser treatments. 10. Familiarize with safety protocols and precautions associated with medical laser procedures.
Indicative Contents المحتويات الإرشادية	Light Nature and Laser Generation, Introduction of Electromagnetic Spectrum, Absorption and Emission, Laser Levels System, Properties of Laser Light. (7 hrs) Laser System Design (Active medium, Pumping Source as an Excitation Mechanism, Optical Resonator). (6 hrs)

	Medical Laser Delivery System; Understanding Structure of an Optical Fiber, Types of Optical Fiber, Photonic Crystal Fiber and transmission Characteristics of Fiber Cable and 7-Articular arms. (12 hrs) Laser System Types and Properties (1. Solid state laser (Ex: Ruby Laser, Nd:YAG and Nd:YLF), 2. Gas Laser(Ex: He-Ne, CO₂, N₂ and Argon Ion Laser). (3. Semiconductor Laser, 4. Dye laser (Ex: Tunable Dye and Flowing Dye)). (8 hrs) Laser Detectors (Quantum Detector, Vacuum Photodiode, and photomultiplier) (5 hrs) Interaction Between Laser Radiation and Biological Tissue (Intensity of Radiation, Shape of Irradiation, Spatial Nature of Laser Beam). Laser Effect In Biological Tissue (Mechanisms of Laser- tissue interaction, Photochemical Interaction, Photomechanical interaction, Photothermal Interaction, Photoablation Interaction, Plasma-Induced Photoablation and Photodisruption). (6 hrs) Laser Medical Application Categorization According to (Type of Laser, Type of Treatment, Organ) (3 hrs) Laser Medical Application in(Surgery, Dermatology, Ophthalmology, Dentistry, Oncology, Urology) (9 hrs) Laser Hazards; Understanding the Classification of laser hazard According to the Intensity. The Standard level for Safe Working Environments. (8 hrs)
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Lecture-based Instruction, Hands-on Laboratory Sessions, Guest Speakers and Industry Experts, Field Visits and Clinical Observations, Collaborative Learning, Assessment Methods, Continuous Learning and Professional Development
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Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	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% (10)	5,9	LO #4,#5,#6,and #7,
	Assignments	2	5% (5)	4,10	LO #3 and #10
	Project / Lab.	5	20% (20)	Continuous	All
	Report	1	5% (5)	12	LO #4, #5 and #10, #11
Summative assessment	Midterm Exam	2hr	10% (10)	13	LO #1.....#7
	Final Exam	3hr	50% (50)		All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Light Nature and Laser Generation, Introduction of Electromagnetic Spectrum, Absorption and Emission, Laser Levels System, Properties of Laser Light.
Week 2	Laser System Design (Active medium, Pumping Source as an Excitation Mechanism, Optical Resonator).
Week 3	Medical Laser Delivery System; Understanding Structure of an Optical Fiber, Types of Optical Fiber, Photonic Crystal Fiber and transmission Characteristics of Fiber Cable and 7-Articular arms.
Week 4	Laser System Types and Properties (1. Solid state laser (Ex: Ruby Laser, Nd:YAG, Nd:YLF and Er:YAG), 2. Gas Laser (Ex: He-Ne, CO ₂ , N ₂ and Argon Ion Laser).
Week 5	Laser System Types and Properties (3. Semiconductor Laser, 4. Dye laser (Ex: Tunable Dye and Flowing Dye)).
Week 6	Laser Detectors (Quantum Detector, Vacuum Photodiode, and photomultiplier)
Week 7	Mid Term Exam
Week 8	Interaction Between Laser Radiation and Biological Tissue (Intensity of Radiation, Shape of Irradiation, Spatial Nature of Laser Beam). Laser Effect In Biological Tissue (Mechanisms of Laser- tissue interaction, Photochemical Interaction, Photomechanical interaction,

	Photothermal Interaction, Photoablation Interaction, Plasma-Induced Photoablation and Photodisruption).
Week 9	Laser Medical Application Categorization According to (Type of Laser, Type of Treatment, Organ)
Week 10	Laser Medical Application in Surgery and Laser Medical Application in Dermatology
Week 11	Laser Medical Application in Ophthalmology
Week 12	Laser Medical Application in Dentistry
Week 13	Laser Medical Application in Oncology
Week 14	Laser Medical Application in Urology
Week 15	Laser Hazards; Understanding the Classification of laser hazard According to the Intensity.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab safety - Tools
Week 2	Reflection, Refraction and Total Internal Reflection
Week 3	Divergence
Week 4	Semiconductor Manufacturing
Week 5	Emission Circuit Design
Week 6	Detection Circuit Design
Week 7	Optical Fiber Types, Color Scheme and Intro to Connectors
Week 8	Optical Fiber Characterization
Week 9	Optical Fiber Characterization
Week 10	Splicing (Mechanical)
Week 11	Splicing (Automated)
Week 12	Optical fiber losses
Week 13	Preparing for the Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	An introduction to the Laser theory and applications By M. N. Avadhanulu and Dr. P. S. Hemne. Optical Fiber Communications By Gerd Keiser, second edition. Laser Principles and Applications By J. Wilson.	No Yes No
Recommended Texts	Photonics Linear and non Linear Interactions of Laser and Matter	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.


أ.د. هارون عبد الكاظم
العميد

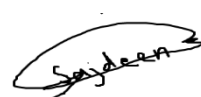
عميد الكلية : أ.د. هارون عبد الكاظم شهد

التاريخ : 2026 / 3 / 22



رئيس القسم : أ.د. محمود شاكر نصر

التاريخ : 2026 / 3 / 22



اسم التدريسي: م.م. ساجدين كاظم داود

التاريخ : 2026 / 3 / 22