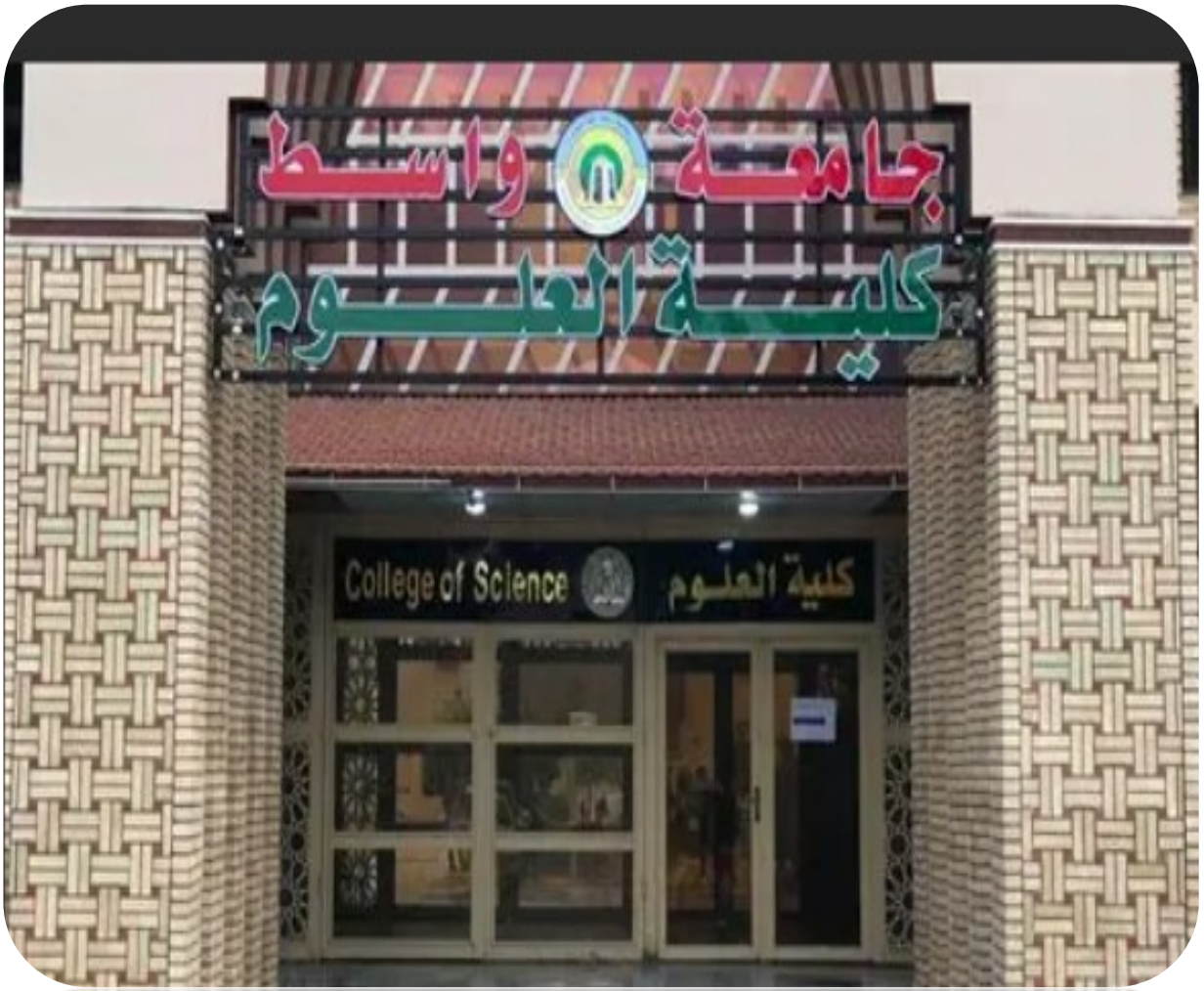
Republic of Iraq

Ministry of Higher Education and Scientific Research

University of Wasit

College of Science – Physics Department



2025-2026

Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Academic Program and Course Description Guide

2025-2026

Academic Program Description Form

University name/Wasit University

College/Institute/ College of Science

Scientific Department/ Department of Physics

Name of the academic or professional program/

Bachelor's degree in Physics

Name of Final degree/ Bachelor of Science in Physics

Academic system:/ Bologna Process (ECTS Credit System)

Description Preparation Date:2025-2026

File Completion Date: 1/ 2 / 2026

Signature:

Head of Department Name:

Dr. Najwa Jassim Jubier

Date: 1 /2 / 2026

Signature:

Scientific Associate Name:

Dr. Faiq Jameel Hassan

Date: 15/ 2 /2026

The File is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date/

Signature/

م.م دنيا فاضل عباس
مسؤول شعبة ضمان الجودة والاداء الجامعي

Approval of the Dean

Introduction

Wasit University was established in 2003 and includes a wide range of scientific and humanities colleges. Among these, the College of Science is considered one of the core colleges, playing a significant role in preparing scientific and research-oriented graduates.

The College of Science is one of the colleges affiliated with the Ministry of Higher Education and Scientific Research in Iraq. It comprises several scientific departments, including Physics, Chemistry, Biology, and Mathematics, among other disciplines.

The Bologna Process is one of the modern international frameworks aimed at developing higher education systems and improving the quality of academic programs in universities. It seeks to enhance compatibility and transparency among higher education institutions at the international level, facilitating student mobility and mutual recognition of academic qualifications, in addition to strengthening the quality of education and scientific research.

Within this context, the course description serves as a fundamental tool for organizing the educational process. It outlines course objectives, intended learning outcomes, course content, teaching and learning strategies, as well as assessment methods. It also emphasizes student-centered learning and the development of analytical thinking and scientific research skills, thereby preparing students with the knowledge and competencies required to keep pace with scientific and professional advancements.

This description aims to provide a clear and well-structured framework for the course, aligned with the academic quality standards adopted within the Bologna system. It ensures the integration of theoretical knowledge with practical applications and contributes to enhancing students' scientific and practical capabilities.

Academic Program Description

The Bachelor of Science in Physics Program (General Physics and Medical Physics) provides a concise overview of the program's vision, mission, and objectives. It includes a clear and comprehensive specification of the intended learning outcomes, aligned with well-

defined teaching and learning strategies. The program is designed to equip students with fundamental and applied knowledge in physics, develop their analytical and research skills, and prepare them to meet labor market requirements and pursue postgraduate studies.

Course Description

The course description provides a concise summary of the key features of each course, including its content, structure, and expected learning outcomes. It demonstrates the extent to which students achieve the intended learning outcomes and benefit from available learning opportunities. Each course is derived from and aligned with the overall Academic Program Description to ensure coherence and consistency within the program.

1. **Program Vision**
To be a distinguished and innovative academic program in physics education, providing high-quality learning in both General Physics and Medical Physics, and preparing competent graduates capable of excellence in scientific research, healthcare, and industrial fields, while contributing to sustainable development and meeting the evolving needs of society and the labor market

2. **Program Mission**
To provide high-quality education in physics by equipping students with strong theoretical foundations and practical skills in both General Physics and Medical Physics tracks. The program aims to prepare competent graduates capable of applying physics principles in scientific, industrial, and medical fields, engaging in research activities, and responding to the needs of the labor market and society

3. **Program Objectives**
1. To prepare graduates with a solid foundation in fundamental and applied physics in both General Physics and Medical Physics. 2. To develop students' analytical, critical thinking, and problem-solving skills. 3. To equip students with practical laboratory skills and the ability to use modern scientific and medical technologies. 4. To prepare graduates for employment in education, industry, healthcare, and research institutions. 5. To promote scientific research and encourage student participation in research activities.

6. To develop communication, teamwork, and professional skills.
7. To instill ethical and professional values, especially in medical applications of physics.
8. To prepare graduates for postgraduate studies in various fields of physics.
9. To align the program with labor market needs through continuous curriculum development.
10. To contribute to community service through applications of physics in energy, environment, and healthcare sectors.

4. Program Accreditation

Is there a sponsor for the program?

No

5. Other external influences

Several external factors influence the Physics Academic Program's development and continuous improvement, including labor market requirements that guide curriculum updates, scientific and technological advancements, and integration of modern teaching methods, and frequent academic interruptions that may impact schedule continuity and course completion.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	**8**	**450**		
College Requirements	**4**	**500**		
Department Requirements	**26**	**3550**		
Summer Training				
Other				

Curriculum Structure

The curriculum structure of the Bachelor of Science in Physics Program (General Physics and Medical Physics tracks) includes all courses offered within the academic program in accordance with the adopted Bologna Process (ECTS system). The curriculum is designed to ensure a balanced integration of theoretical knowledge and practical skills, distributed across different levels of study.

The program comprises various categories of courses, including university requirements, college requirements, and department (major) requirements, in addition to elective courses. Each course is assigned a specific number of credit units (ECTS credits), reflecting the total student workload, including structured and unstructured learning activities.

The curriculum is carefully organized to support the progressive development of students' knowledge, skills, and competencies; ensuring alignment with the program's learning outcomes and labor market needs. It also provides flexibility through elective courses and specialization tracks (General Physics and Medical Physics), starting from the third academic stage.

General Physics

7. Program Description/ General Physics									
Year 1\ 2nd	Course Code	Course Name		Credit Hours				ECTS	Module Type
				CL (hr/w)	Lab (hr/w)	Tut (hr/w)	Semn (hr/w)		
UGI/First semester	PHY-111	Mechanics	ميكانيك	2	2	1		8	C
	PHY-112	Electricity	كهربانية	2	2	1		8	C
	PHY-113	Mathematics I	الرياضياتI	2		2		7	B
	WUO3	Computer I	حاسوبI	2	2			3	S
	WUO4	Human Rights and democracy	حقوق الانسان والديقراطية	2				2	S
	WUO1	Arabic Language I	اللغة العربيةI	2				2	S
	Total			12					

					6	4		30	
UGI/ Second semester	PHY-121	Properties of Materials	خواص مادة	2	2	1		7	C
	PHY-122	Magnetism	مغناطيسية	2	2	1		7	C
	PHY-123	Mathematics II	الرياضياتII	2		2		6	B
	PHY-124	General Astronomy	فلك عام	2		1		5	B
	WU22	Compter II	الحاسوبII	2	2			3	S
	WUO2	AcademicEnglish I	اللغة الانكليزية الاكاديميةI	2				2	S
	Total			12	6	5		30	
UGII/Third semester	PHY-211	Modern Physics I	الفيزياء الحديثةI	2	2	1		6	C
	PHY-212	Heat and Thermodynamic	حرارة وثرموداينمك	2	2	1		6	C
	PHY-213	Analytical Mechanics I	ميكانيك تحليليI	2		1		4	C
	PHY-214	Analog Electronics	الكترونيات تماثلية	2	2	1		6	C
	PHY-215	MathematicsIII	الرياضياتIII	2		1		3	B
	PHY-216	Numerical analysis	تحليل عددي	2	2			3	B
	WU23	English Language II	اللغة الانكليزيةII	2				2	S
	Total			14	8	5		30	
UGII/Fourth semester	PHY-221	Modern Physics II	الفيزياء الحديثةII	2	2	1		6	C
	PHY-222	Thermodynamic and Statistical	الديناميكية الحرارية والاحصائية	2	2	1		6	C
	PHY-223	Analytical Mechanics II	ميكانيك تحليليII	2		1		4	C
	PHY-224	Digital Electronics	الكترونيات رقمية	2	2	1		6	C
	PHY-225	Mathematics IV	الرياضياتIV	2		1		4	B
	WU21	Arabic Language II	اللغة العربيةII	2				2	S
	WUO5	Crimes of the Baath Regime in Iraq	جرائم نظام البعث في العراق	2				2	S
	Total			14	6	5		30	

UGIII/Fifth semester	PHY-311	Geometrical Optics	بصريات هندسية	2	2	1		6	C
	PHY-312	Laser Physics I	فيزياء الليزر	2	2	1		6	C
	PHY-313	Quantum Mechanics I	ميكانيك الكم	2		2		4	C
	PHY-314	Material Physics I	فيزياء المواد	2	2	1		6	C
	PHY-315	Semiconductor	اشباه موصلات	2		1		4	B
	PHY-316	Optional I(solar energy)	اختياريI (طاقة شمسية)	2		1		4	E
	Total			12	6	7		30	
UGIII/Sixth semester	PHY-321	Physical Optics	بصريات فيزيائية	2	2			6	C
	PHY-322	Laser Physics II	فيزياء الليزرII	2	2	1		6	C
	PHY-323	Quantum Mechanics II	ميكانيك الكمII	2		2		4	C
	PHY-324	Material Physics II	فيزياء الموادII	2	2	1		6	C
	PHY-325	Molecular Physics	فيزياء جزيئية	2		1		4	C
	PHY-326	Optional II(Environment and pollution)	اختياريII (بيئة وتلوث)	2			1	4	E
	Total			12	6	5	1	30	

Medical Physics

7. Program Description/ Medical Physics									
Year 1\ 2nd	Course Code	Course Name	اسم المادة الدراسية	Credit Hours				ECTS	Module Type
				CL (hr/w)	Lab (hr/w)	Tut (hr/w)	Semn (hr/w)		
UGI/First semester	PHY-111	Mechanics	ميكانيك	2	2	1		8	C
	PHY-112	Electricity	كهربائية	2	2	1		8	C
	PHY-113	Mathematics I	الرياضياتI	2		2		7	B
	WUO3	Computer I	حاسوبI	2	2			3	S
	WUO4	Human Rights and democracy	حقوق الانسان والديقراطية	2				2	S
	WUO1	Arabic Language I	اللغة العربيةI	2				2	S
	Total			12	6	4		30	
UGI/ Second semester	PHY-121	Properties of Materials	خواص مادة	2	2	1		7	C
	PHY-122	Magnetism	مغناطيسية	2	2	1		7	C
	PHY-123	Mathematics II	الرياضياتII	2		1		6	B
	PHY-124	General Astronomy	فلك عام	2		1		5	B
	WU22	compter II	الحاسوبII	2	2			3	S
	WUO2	AcademicEnglish I	اللغة الانكليزية الاكاديميةI	2				2	S
	Total			12	6	4		30	
	PHY-211	Modern Physics I	الفيزياء الحديثةI	2	2	1		6	C
	PHY-212	Heat and Thermodynamic	حرارة وثرموداينمك	2	2	1		6	C

UGII/Third semester	PHY-213	Analytical Mechanics I	ميكانيك تحليليI	2		1		4	C
	PHY-214	Analog Electronics	الكترونيات تماثلية	2	2	1		6	C
	PHY-215	MathematicsIII	الرياضياتIII	2		1		3	B
	PHY-216	Numerical analysis	تحليل عددي	2	2			3	B
	WU23	English Language II	اللغة الانكليزيةII	2				2	S
	Total			14	8	5		30	
UGII/Fourth semester	PHY-221	Modern Physics II	الفيزياء الحديثةII	2	2	1		6	C
	PHY-222	Thermodynamic and Statistical	الديناميكية الحرارية والاحصائية	2	2	1		6	C
	PHY-223	Analytical Mechanics II	ميكانيك تحليليII	2		1		4	C
	PHY-224	Digital Electronics	الكترونيات رقمية	2	2	1		6	C
	PHY-225	Mathematics IV	الرياضياتIV	2		1		4	B
	WU21	Arabic Language II	اللغة العربيةII	2				2	S
	WUO5	Crimes of the Baath Regime in Iraq	جرائم نظام البعث في العراق	2				2	S
	Total			14	6	5		30	

UGIII/Fifth semester	PHY-311	Anatomy	التشريح	2	2		1	6	C
	PHY-312	Medical Physics I	الفيزياء الطبية I	2	2		1	6	C
	PHY-313	Physics of Diagnostic Radiology I	فيزياء الاشعة التشخيصية I	2			1	4	C
	PHY-314	Optics (Geometrical and Physical)	بصريات (هندسية وفيزيائية)	2	2	1		6	C
	PHY-315	Radiation Protection	الوقاية من الاشعاع	2			1	4	C
	PHY-316	Option I (spectra)	اختياري I (اطياف)	2		1		4	E
	Total			12	6	2	4	30	
UGIII/Sixth semester	PHY-321	Physiology	الفسلجة	2	2		1	6	C
	PHY-322	Medical Physics II	الفيزياء الطبية II	2	2		1	6	C
	PHY-323	Physics of Diagnostic Radiology II	فيزياء الاشعة التشخيصية II	2	2		1	6	C
	PHY-324	Quantum Mechanics	ميكانيك الكم	2		2		4	C

	PHY-325	Lasers in Medicine	ليزر في الطب	2			1	4	C
	PHY-326	Option II (Physics of Living Systems)	اختياري II (فيزياء الانظمة الحية)	2			1	4	E
	Total			14	6	2	6	30	

8- Learning Outcomes

After completing this course, students will be able to:

1- Explain the fundamental concepts and theoretical principles related to the course.
2- Analyze and interpret scientific phenomena based on established laws and principles.
3- Apply theoretical knowledge to solve scientific and practical problems related to the course.
4- Use appropriate scientific tools and techniques to perform experiments and analyses.
5- Demonstrate critical and analytical thinking in addressing scientific issues.
6- Work effectively both independently and as part of a team to accomplish scientific tasks.
7- Present and communicate scientific results clearly through written reports and oral presentations.
8- Relate theoretical knowledge to practical applications in various scientific fields**.**

9- Teaching and Learning Strategies

The teaching and learning strategies adopted in this course aim to enhance students' understanding and achieve the intended learning outcomes through a variety of methods, including:

1. Lectures to present fundamental concepts and theoretical knowledge.
2. Interactive discussions to encourage student participation and critical thinking.
3. Laboratory work to develop practical skills and apply theoretical knowledge.
4. Problem-solving sessions to improve analytical and scientific thinking.
5. Assignments and projects to enhance independent learning and research skills.
6. Group work to promote teamwork and communication skills.
7. Seminars (student presentations) to develop presentation, discussion, and research skills.
8. Quizzes to assess students' understanding and provide continuous feedback.
9. Use of modern technologies such as simulations, e-learning platforms, and multimedia tools.
10. Self-directed learning encourages students to take responsibility for their own learning**.**

10.Evaluation Methods

Implemented at all stages of the program in general.

1. Exams.
2. Writing scientific reports and research and presenting them.
3. Scientific discussions.
4. Attendance and daily activities.
5. Daily tests.

11. Faculty

The academic program is supported by a qualified and experienced team of faculty members who are committed to delivering high-quality education and fostering a productive learning environment. The teaching staff possesses diverse academic backgrounds and specializations that align with the program's objectives and curriculum requirements. They are actively engaged in teaching, research, and academic supervision, contributing to the development of students' knowledge, skills, and critical thinking abilities. In addition, faculty members participate in continuous professional development activities to ensure the adoption of modern teaching methodologies and the maintenance of academic standards in accordance with institutional and accreditation requirements.

11. 11.

Faculty Members

No.	Academic Rank	Specialization		Special Requirements/Ski (if applicable)		Number of the teaching s	
		General	Special			Staff	Lecturer
1-	Prof.Dr. Abbas Fadhel Essa Jassim	**Physics**	**Materials Physics**			✓	
2-	Prof. Dr. Ahmed Khader Abbas Mahdi	**Physics**	**Plasm Physics**			✓	
3-	Prof.Dr. Hadi Dweij Zarzour Mashial	**Physics**	**Nuclear Physcics**			✓	
4-	Prof.Dr. Muneer Hlail Jaduaa Abdalla	**Physics**	**Semiconductor Physics**			✓	
5-	Prof. Dr. Hashem Ali Yasser Thuwainee	**Physics**	**Materials Physics**			✓	
6-	Prof,Dr,Najwa Jassim Jubier Abbas	**Physics**	**Materials Physics**			✓	
7-	Mohammed Juber Resen Aldhuhaibat	**Physics**	**Nuclear Physcics**			✓	
8-	Asst. Prof. Dr. Mutasim Abrahim Malik Ali	**Physics**	**Remote sensing and image processing**			✓	
9-	Asst.Prof.Dr. Ali Kamel Mohsin Nasir	**Physics**	**Laser applications**			✓	
10-	Asst.Prof.Dr. Khudhair Abbas Assaf Ajeel	**Physics**	**Astrophysics/ Astonomical spectrum Measurements**			✓	
11-	Asst. Prof. Dr Mahdi Ahmed Mohammed Mahdi	**Physics**	**Nanophysics**			✓	

12-	Asst.Prof.Dr Faik Jamil Hassan Hameed	**Mathematics**	**Mathematical analysis**			✓	
13-	Asst.Prof.Dr. Hanan Abd Ali Thjeel khalfa	**Physics**	**Laser and Electro-Optics**			✓	
14-	Asst. Prof. Dr. Ahmed Jaddah Farhan Dhahab	**Physics**	**Materials Physics**			✓	
15-	Asst. Prof. Dr. Muhannad Ali Hussein Zughair	**Physics**	**Electronics**			✓	
16-	Asst. Prof. Dr. Ghada Ayad Kadhim abod	**Physics**	**/Thin Films**			✓	
17-	Asst Prof.Dr. Maitham Salman Amana Salem	**Physics**	**Environmental Studies \Fhysical Branch**			✓	
18-	Asst. Prof. Dr. Ali Jabbar Freih Obaid	**Physics**	**Materials Physics**			✓	
19-	Asst. Prof. Dr. Saba Farhan Hathot Jasim	**Material Science**	**Material Technologies**			✓	
20-	Asst.Prof.Dr .Waleed kamil abdulkadhim Abdullah	**Applied Physics**	**Nanotechnology**			✓	
21-	Asst.Prof.Dr. Firas mohamed Dashoor Sabut	**Physics**	**Nanotechnology**			✓	
22-	Asst.Prof.Dr.Oday Jawad Kadhim Hadhood	**Physics**	**Nanotechnology**			✓	
23-	Asst . Prof. Dr. Nadia Naeema Dhahir Thathaa	**Physics**	**Materials Physics**			✓	
24-	Asst.Prof.Dr. Najlaa Jerjack Abdullah Karmash	**Physics**	**Materials Physics**			✓	
25-	Asst.Prof.Dr. Manal Jabbar Khalifa Alali	**Physics**	**Optoelectronics**			✓	
26-	Lec.Dr. Eidan Asi Abdullah Aifan	**Physics**	**Laser and Electro-Optics**			✓	
27-	Lec.Dr. Zeina Abbas Salman Waheed	**Physics**	**Biophysics**			✓	
28-	Lec .Dr. Sattar Hussein Suwailem Ghadhib	**Physics**	**Laser and Optics**			✓	
29-	Lec .Dr. Muhannad Abdulkareem Saadoun	**Atmospheric science**	**Renewable energy**			✓	
30-	Lec DrAhmed Abdul Mahdi Abdul Karim Jasim	**Electrical Engineering**	**computer control**			✓	
31-	Lec .Dr. Ali Karim Aboud Mohammed	**Physics**	**Materials Physics**			✓	
32-	Lec .Dr. Shaimaa Hussien Shahad Hamza	**Physics**	**Remote sensing**			✓	
33-	Lec .Dr. Hassnein Farman Aboud Lafta	**Psychology**	**Educational Psychology**			✓	
34-	Lec .Dr. Hassanein Rahim Abd Matrood	**Physics**	**Nanotechnology**			✓	
35-	Lec .Dr.Shaymaa Saadoon Hashim Hmood	**Physics**	**Materials Physics**			✓	
36-	Lec .Wasan Ali Hussein Hassan	**Physics**	**Theoretical and Molecular Physics**			✓	

37	Lec .Dr.Ahmed Abdulkadhim Thamer Khaji	**Physics**	**NanoMaterials**			✓	
38	Lec .Dr. Zaynab Ali Harbi Awfi	**Physics**	**Thin Films**			✓	
39	Lec .Dr.Haider Majid Tuma Hassoon	**Physics**	**Remote sensing**			✓	
40	Lec .Dr. Fatima Fadhil Abbas Wadi	**Physics**	**Laser and Electro-Optics**			✓	
41	Lec .Dr. Ruaa Hilal Hassani Daher	**Physics**	**NanoMaterials**			✓	
42	Lec .Dr.Reyam Abdul Hussein Noori Radhi.	**Physics**	**Nuclear Physcics**			✓	
43	Lec .Dr.Mohammed Jumaah Tuama	**Physics**	**Thin Films**			✓	
44	Lec .Hussein Mahdi Hamad Fankhar	**Mechanical Engineering**	**Thermal Mechanics Engineering**			✓	
45	Lec .Ola Abdullah Manati Joudah	**Physics**	**General Phscics**			✓	
46	Asst. Lec. Imad Kamil Zayer Daish	**Physics**	**Astronomy**			✓	
47	Asst. Lec.Hoda Musa Mutlaq Attar	**Physics**	**General Phscics**			✓	
48	Asst. Lec. Nagham Abd Ulameer yaseer Mosin	**Physics**	**General Phscics**			✓	
49	Asst. Lec. Salman Rasool Salman Dawood	**Physics**	**Remote sensing and image processing**			✓	
50	Asst. Lec. Adday Raddad Hussein Anfaweh	**Applied Physics**	**Communications**			✓	
51	Asst. Lec. kholoud dham khamkheem dhamosh	**Physics**	**General Phscics**			✓	
52	Asst. Lec. Rusul Saeed Radhi abed	**Physics**	**Nano Physics**			✓	
53	Asst. Lec. Zahraa Razzaq Dakhl Hussain	**Physics**	**General Phscics**			✓	
54	Asst. Lec. Zainab Kareem Lateef Hassan	**Physics**	**General Phscics**			✓	
55	Asst. Lec. Mohammed Jaber Mohammed Lahmood	**Physics**	**General Phscics**			✓	
56	Asst. Lec. Noor Hussein Majeed Mohamed	**Physics**	**sold state and materials physics**			✓	
57	Asst. Lec. Saif Jawad Kadhim Obaid	**Physics**	**Theoretical and Molecular Physics**			✓	
58	Asst. Lec. Faraqad Faisal Aidan Mohammed	**Physics**	**General Phscics**			✓	
59	Asst. Lec. Ali Kazim Hamad Mahrath	**Management and Economics**	**Accounting Economics**			✓	
60	Asst. Lec. Amer Shamil Abdulrahman Hussein	**Mathematics**	**Commutative Algebra**			✓	
61	Asst. Lec. Reem Hussein Abdullah Haris	**Physics**	**General Phscics**			✓	

62	Asst. Lec. Wafaa Khudhair Salman Dhahir	**Physics**	**General Phscics**			✓	
63	Asst. Lec. Inas Allawi Razzaq Gbr	**Physics**	**General Phscics**			✓	
64	Asst. Lec. Hussein Abdul Ilah Yassin Sakhy	**Physics**	**General Phscics**			✓	
65-	Software Engineer Sajjad Flaih Hassan Zaibel	**Computer Engineering**	**Computer Engineering**			✓	
66	Asst.physicist Alaa Lateef Shather Musa	**Physics**	**General Phscics**			✓	
67	Asst.physicist Duaa Mohammed Rashad Kadhim	**Physics**	**General Phscics**			✓	
68	Prof.Dr.Jafar Abbas Essa Jassim	**biology**	**biology**				✓
69	Lecture Dr. Ahmed Abdulhamid Rasan	**Arabic**	**Arabic**				✓

12. Professional Development

Mentoring new faculty members

Directing new faculty members to the need to work on developing the scientific method, methods of delivering scientific lectures, and how to deliver scientific material to students.

Professional development of faculty members

The program supports ongoing faculty professional development through training, workshops, and seminars. These activities enhance teaching skills, curriculum design, modern pedagogy, assessment, and the integration of educational technologies. Faculties are also encouraged to conduct research, publish in reputable journals, and collaborate with institutions worldwide to ensure high-quality education aligned with global standards.

13. Acceptance Criterion

Students who have completed and successfully passed secondary school (scientific branch) are eligible for admission to the College of Science, Department of Physics, provided they achieve a minimum average of 70% or higher.

14. The most important sources of information about the program

Key sources of information about the program include the university website, program specifications, the student handbook, official documents, quality assurance reports, and faculty guidance. In addition, the program relies on textbooks prescribed by the Ministry of Higher Education and Scientific Research, as well as external scientific

references and publications. Students and faculty also make use of libraries and online resources, including the internet, to support learning and research activities.

15.Program Development Plan

The department adopts comprehensive academic and research development plans aimed at continuously improving the quality of the program. The Department Head, Department Council, and Scientific Committee work collaboratively to identify needs, set priorities, and ensure the provision of all necessary resources to support program development. These efforts include updating the curriculum, enhancing teaching and learning methods, supporting scientific research, and improving laboratory facilities, in alignment with quality assurance standards and labor market requirements.

Program Skills Outline															
Required program Learning outcomes															
Year/Level	Course Code	CourseName	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
UGI/First Semester General and Medical Physics	PHY-111	Mechanics	C	✔	✔			✔	✔			✔			
	PHY-112	Electricity	C	✔	✔			✔	✔			✔			
	PHY-113	Mathematics I	B	✔	✔	✔		✔	✔						
	WUO3	Computer I	S	✔				✔	✔	✔					
	WUO4	Human Rights and democracy	S				✔					✔	✔	✔	✔
	WUO1	Arabic Language I	S	✔			✔		✔		✔	✔			
UGI/ Second Semester General and Medical Physics	PHY-121	Properties of Materials	C	✔	✔	✔		✔	✔	✔		✔			
	PHY-122	Magnetism	C	✔	✔			✔	✔			✔			
	PHY-123	Mathematics II	B	✔	✔	✔		✔	✔						
	PHY-124	General Astronomy	B	✔	✔		✔	✔				✔	✔		
	WU22	Computer II	S	✔				✔	✔	✔	✔				
	WUO2	AcademicEnglish I	S	✔			✔		✔		✔	✔	✔		
UGII/Third Semester General and Medical Physics	PHY-211	Modern Physics I	C	✔	✔	✔	✔	✔	✔			✔			
	PHY-212	Heat and Thermodynamic	C	✔	✔	✔		✔	✔			✔			
	PHY-213	Analytical Mechanics I	C	✔	✔	✔		✔	✔	✔					
	PHY-214	Analog Electronics	C	✔	✔			✔	✔	✔	✔	✔			
	PHY-215	MathematicsIII	B	✔	✔	✔		✔	✔	✔					
	PHY-216	Numerical analysis	B	✔	✔	✔		✔	✔	✔	✔				
	WU23	English Language II	S	✔	✔	✔	✔	✔	✔			✔			
UGII/Fourth Semester General and Medical Physics	PHY-221	Modern Physics II	C	✔	✔	✔	✔	✔	✔	✔		✔			
	PHY-222	Thermodynamic and Statistical	C	✔	✔	✔		✔	✔	✔		✔			
	PHY-223	Analytical Mechanics II	C	✔	✔	✔		✔	✔	✔	✔				
	PHY-224	Digital Electronics	C	✔	✔			✔	✔	✔	✔	✔			

UGIII/Fifth semester General Physics	PHY-225	Mathematics IV	B	✔	✔	✔		✔	✔	✔					
	WU21	Arabic Language II	S	✔			✔		✔		✔	✔	✔		
	WUO5	Crimes of the Baath Regime in Iraq	S				✔					✔	✔	✔	✔
	PHY-311	Geometrical Optics	C	✔	✔	✔		✔	✔						
	PHY-312	Laser Physics I	C	✔	✔	✔	✔	✔	✔	✔					
	PHY-313	Quantum Mechanics I	C	✔	✔	✔	✔	✔	✔	✔					
	PHY-314	Material Physics I	C	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
	PHY-315	Semiconductor	B	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
	PHY-316	Optional I(Solar Energy)	E	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
UGIII/Sixth Semester General Physics	PHY-321	Physical Optics	C	✔	✔	✔	✔	✔	✔	✔		✔			
	PHY-322	Laser Physics II	C	✔	✔	✔	✔	✔	✔	✔	✔	✔			
	PHY-323	Quantum Mechanics II	C	✔	✔	✔	✔	✔	✔	✔	✔				
	PHY-324	Material Physics II	C	✔	✔	✔		✔	✔	✔	✔	✔			
	PHY-325	Molecular Physics	C	✔	✔	✔	✔	✔	✔	✔		✔			
	PHY-326	Optional II(Environment and pollution)	E	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
UGIII/Fifth Semester Medical Physics	PHY-311	Anatomy	C	✔	✔		✔		✔			✔	✔		
	PHY-312	Medical Physics I	C	✔	✔	✔	✔	✔	✔			✔			
	PHY-313	Physics of Diagnostic Radiology I	C	✔	✔	✔	✔	✔	✔	✔		✔	✔		
	PHY-314	Optics (Geometrical and Physical)	C	✔	✔	✔		✔	✔						
	PHY-315	Radiation Protection	C	✔	✔		✔		✔			✔	✔	✔	
	PHY-316	Optional I (spectra)	E	✔	✔	✔		✔	✔	✔					
	PHY-321	Physiology	C	✔	✔		✔		✔			✔	✔		

UGIII/Sixth Semester Medical Physics	**PHY-322**	**Medical Physics II**	**C**	✔	✔	✔	✔	✔	✔	✔		✔			
	PHY-323	**Physics of Diagnostic Radiology II**	**C**	✔	✔	✔	✔	✔	✔	✔		✔	✔		
	PHY-324	**Quantum Mechanics**	**C**	✔	✔	✔	✔	✔	✔	✔					
	PHY-325	**Lasers in Medicine**	**C**	✔	✔	✔	✔	✔	✔	✔		✔	✔		
	PHY-326	**Optional II (Physics of Living Systems)**	**E**	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	

First Stage

General &Medical Physics

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Electricity**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-112**				
ECTS Credits	**8**				
SWL (hr/sem)	**200**				
Module Level		UGI	**Semester of Delivery**		1
Administering Department		Physics	**College**	Science	
Module Leader	Asst,Prof.Ghada Ayad Kadhim		**e-mail**	gayad@uowasit.edu.iq	
Module Leader's Acad. Title		Assistant Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		01/06/2025	**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	**Lab. of Electricity**	**Semester**	1

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Enable the student to know the basics of electricity. 2. The student's knowledge of electric charges and the forces that deal with them. 3. Enable the student to analyze electrical circuits and the basic elements of the circuit from resister and capacitance. 4. Analyzing electrical circuits mathematically. 5. Practical application of theoretical material in the laboratory.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding and teaching the student the basics of electrical and mathematical physics related to the science of electrical physics, and teaching him electrical circuits and everything related to them. 2. Enable students to obtain knowledge and understanding in working on modern electrical circuits. 3. Enable students to obtain knowledge and understanding of the design of various electrical circuits. 4. Explanation of the topics of electrical foundations by specialists in the subject, with an emphasis on the use of mathematics as a basis for understanding and learning. 5. Provide them with practical problem-solving skills related to electrical circuits. 6. Emphasis is placed on the topics of the basics of electricity and the analysis of electrical circuits using programmable control systems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Theoretical basis of electricity Electric charge and types of materials in terms of conductivity (conductive and insulating) and examples around them. [15 hrs] The electric force that controls the charge, represented by Coulomb's law, with an explanation of the theoretical concept of this law in addition to exercises. [13 hrs] Electric potential, its theoretical basis, laws and derivation, in addition to mathematical problems. [12 hrs] Gauss's Lawand its theoretical basis, applications and mathematical issues around it. [13 hrs] Potential Gradient and how to derive it and its mathematical problems. [8hrs] Part B - electrical circuits Connecting the capacitors in series, parallel, complex connection, and explaining the theoretical basis with examples and exercises. [10 hrs] Ohm's law and its mathematical basis with examples and exercises. [12 hrs] Connecting resistors in series, parallel and omplex connection with examples and

	exercises. [15 hrs]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	1. 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 critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. 2. Make the student able to use the devices in the electrical laboratory and carry out experiments. 3. The student should be able to prepare reports on laboratory experiments and discuss the results.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**79**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.27**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**121**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**8.07**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

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	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Electric Force**
Week 2	**The Electric Field**
Week 3	**Electric Field Lines**
Week 4	**Electric Flux**
Week 5	**Gauss' Law**
Week 6	**E-field Calculation with Gauss' Law**
Week 7	**Exam**
Week 8	**Gauss' Law and Conductors**
Week 9	**Potential Energy and Conservative Forces**
Week 10	**Electric Potential**
Week 11	**Relation Between Electric Field E and Electric Potential V**
Week 12	**Equipotential Surfaces**
Week 13	**Capacitors**
Week 14	**Energy Storage in Capacitor**
Week 15	**Ohm's Law and Resistance**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Acquaint students with the knowledge of laboratory Electricity and devices used in the laboratory, and how to write reports after conducting experiments**
Week 2	**Ohm's law investigation**
Week 3	**The internal resistance of the voltmeter**
Week 4	**Kirchhoff's law of potential difference**
Week 5	**Calculate the total resistance of the circuit**
Week 6	**Exame**
Week 7	**capacitance charging and discharging**
Week 8	**alculation of the time constant for a capacitive charge and discharge process**
Week 9	**Graphical method for calculating the resistance of an ammeter**
Week 10	**calculating the value of unknown resistance**
Week 11	**Finding the resistance of a lamp**
Week 12	**Charging and discharging the capacitor**
Week 13	**Review of Previous Experiments**
Week 14	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Electricity and Magnetism, Edward M. Purcell's and David J. Morin, 3rd edition, Cambridge University Press, 2013	No
Recommended Texts	**Introduction to Electricity, Magnetism, and Circuits** Copyright Year: 2018 by Samuel J. Ling; Jeff Sanny; William Moebs; and Daryl Janzen, dissidents. Electromagnetic waves and Transmission Lines by R.S.Rao. Dissidents.	No
Websites	https://ocw.mit.edu/courses/8-02t-electricity-and-magnetism-spring-2005/pages/lecture-notes/	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Mechanics**	**Module Delivery**	
Module Type	**Core learning activity**	☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-111**		
ECTS Credits	**8**		
SWL (hr/sem)	**200**		
Module Level	UGI	**Semester of Delivery**	1
Administering Department	Physics	**College**	Science
Module Leader	Asst. Prof. Khudhair Abbas Assaf	**e-mail**	kassaf@uowasit.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee ApprovalDate	**01/06/2025**	**Version Number**	**1.0**

Relation with other Modules العالقة مع المواد الدراسية الأخرى		
Prerequisite module	**None**	**Semester**
Co-requisites module	**Lab.of Mechanics**	**Semester**

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. To develop problem solving skills and understanding of Kinematics 2. To understand Newton's laws. 3. This course deals motion, Distance & Displacement, Speed & Velocity and Acceleration. 4. To deal with Energy, Work, Kinetic Energy, Potential Energy and Conservation of Energy 5. To understand Rotational Motion, Periodic Motion. 6. To analysis Simple Harmonic Oscillator. 7.

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	7. Dealing with type of motions Motion, Distance & Displacement , Speed & Velocity and acceleration and Equations of Motion 8. Studying the Kinematics and Calculus and Kinematics in Two Dimensions. 9. Understanding the dynamics of bodies : Force & Mass, Action-Reaction , Weight, Forces in Two Dimensions and Centripetal Force 10. Dealing with Energy, Work, Kinetic Energy, Potential Energy, Conservation of Energy and Power . 11. Understanding the Impulse & Momentum, Conservation of Momentum, Energy, Momentum in Two Dimensions 12. Studying the Rotational Motion, Rotational Dynamics, Angular Momentum and Rotational Energy 13. Understanding the Periodic Motion, Springs, Simple Harmonic Oscillator and Pendulums
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A -</u> Kinematics, Motion, Distance & Displacement, Speed & Velocity, Acceleration, Equations of Motion, Falling Bodies, Graphs of Motion, Kinematics and Calculus, Kinematics in Two Dimensions, Projectiles. [15 hrs] Dynamics I: Forces, Force & Mass, Action-Reaction, Weight, Friction, Equilibrium , Forces in Two Dimensions, Centripetal Force [15 hrs] Energy: Work, Energy, Kinetic Energy, Potential Energy, Conservation of Energy and Power. [10 hrs] Dynamics II: Momentum, Impulse & Momentum, Conservation of Momentum, Momentum & Energy and Momentum in Two Dimensions [15 hrs] Revision problem classes [6 hrs] <u>Part B -</u> Rotational Motion: Rotational Kinematics, Rotational Inertia, Rotational Dynamics Rotational Equilibrium, Angular Momentum, Rotational Energy, Rolling and Rotation in Two Dimensions [15 hrs] Planetary Motion: Geocentrism, Universal Gravitation, Orbital Mechanics I and Gravitational Potential Energy [7 hrs] Periodic Motion: Springs, Simple Harmonic Oscillator, Pendulums, Resonance and Elasticity. [15 hrs] Revision problem classes [6 hrs]

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 critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**79**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.27**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**121**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**8. 07**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**200**		

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	All
	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)		

elivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Vectors
Week 2	Newton Laws of Motion
Week 3	Free falling Bodies

Week 4	Velocity & Acceleration
Week 5	Projectile Motion
Week 6	Uniform circular motion
Week 7	Work
Week 8	Energy
Week 9	The movement of the reference axes
Week 10	Conservation of Force
Week 11	Oscillations -1
Week 12	Centre of Mass
Week 13	Collision
Week 14	Rigid Body Mechanics and Rotation Motion
Week 15	Torque
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Acquaint students with the knowledge of laboratory mechanics and devices used in the laboratory, and how to write reports after conducting experiments
Week 2	Simple pendulum
Week 3	Physical pendulum
Week 4	Bifilar pendulum
Week 5	Measurement of Viscosity of a Liquid by Stokes Law
Week 6	Exame
Week 7	The balance of power
Week 8	Free Fall
Week 9	Measurement the coefficient of surface tension of liquid by capillary tube
Week 10	Measurement the density of liquid
Week 11	Review of Previous Experiments
Week 12	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Fundamentals of university physics, volume 1: Alonso, J.finn,	Yes
Recommended Texts	Classical mechanics John r. Taylor	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics I**			**Module Delivery**	
Module Type	**Basic learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-113**				
ECTS Credits	**7**				
SWL (hr/sem)	175				
Module Level		UGI	**Semester of Delivery**		1
Administering Department		Physics	**College**	Sciences	
Module Leader	Najwa Jassim Jubier Abbas		**e-mail**	njassim@uowasit.edu.iq	
Module Leader's Acad. Title		Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		01/06/2025	**Version Number**		1.0

Relation with other Modules العالقة 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 اهداف المادة الدراسية	**1**. Mathematics is a fundamental part of human thought and logic, and integral to attempts at understanding the world and ourselves. 2. Mathematics provides an effective way of building mental discipline and encourages logical reasoning and mental rigor. 3. In addition, mathematical knowledge plays a crucial role in understanding the contents of other subjects such as the science of physics. 4. Providing learners with knowledge of the importance of mathematics in the field of physics 5. Developing positive attitudes regarding this knowledge of mathematical equations and methods that are useful to physicists in a theoretical way. 6. Learn about derivation and differentiation methods. 7. Recognizing the basic concepts of mathematics. 8. Identify the stages of development of mathematics and the importance of mathematical transformations and their future use in physics 9. Familiarize students with linear, exponential, logarithmic, and trigonometric functions in terms of drawing their functions. 10. As well as introducing students to the derivative of functions and their applications in physics.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Integrate the domain of concepts and knowledge from mathematics into the practical application of physics phenomena, and the development of abilities and skills to solve example problems. 2. Know the methods of derivation and differentiation 3. Identify the type of equations used in physical measuring devices 4. Comparison between mathematics and physics in terms of laws, use and usefulness. 5. Learn about basic mathematical methods and study conic sections. 6. Identifying mathematical functions and algebra and linking their importance to physicists. 7. Analyze the results mathematically. 8. On completion of this module, students are expected to have an introductory knowledge of mathematics ready for Maths II.

Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A – Functions, Graphs, and Models Finding Domain and Range, Graphs the functions and Equations, Functions and Models, Find Slope and Linear Functions, Nonlinear Functions and Models, Limits, Algebraic Limits, and Continuity The Derivative of a Function geometric interpretation of the derivative, tangent to the curve, Powers and Polynomials, The Derivative of the Trigonometric functions, The Derivative of Exponential and Logarithmic Functions, The Slope and the Tangent Line, Derivative of the Trigonometric functions, The Chain Rule, Higher-Order Derivatives, and Implicit Differentiation. Part B – Applications of Differentiation Derivatives as Rates of Change, Rolle's and The Mean Value Theorems, L'Hopital's Rule, The slope of the curve, Using First Derivatives to Find Maximum and Minimum Values and Sketch Graphs, Using First Derivatives to Find Maximum and Minimum Values and Sketch Graphs, Using Second Derivatives to Find Maximum and Minimum Values and Sketch Graphs, Graph Sketching: Asymptotes and Rational Functions. Conic sections, parabolas, ellipses, and Revision of problem classes

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• The main strategy for delivering this module will be to encourage students' participation in the exercises while refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, group discussions, and assignments • Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods. • Research groups - nested discussion circles. • Teaching methods include the use of educational technology. • Encouraging students to self-learn

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**63**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**4.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**112**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**7.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5, 10	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Classroom Activities	5	10% (10)	Continuous	All
	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 - Functions,Graphs,and Models, Domain and Range
Week 2	Graphs and Equations
Week 3	Limits and Continuity
Week 4	The Derivative of a Function, geometric interpretation of the derivative.
Week 5	Tangent to the curve. The Derivative of the Trigonometric functions.
Week 6	The Derivative of Exponential and Logarithmic Functions, The Derivatives of a^x and $\log_a x$, The Slope and the Tangent Line.

Week 7	Mid-term Exam
Week 8	The Chain Rule, Higher-Order Derivatives.
Week 9	Implicit Differentiation, Applications of Differentiation, Derivatives as Rates of Change.
Week 10	Asymptotes and Rational Functions Rolle's and The Mean Value Theorems
Week 11	L'Hopital's Rule, The slope of the curve
Week 12	Using First Derivatives to Find Maximum and Minimum Values and Sketch Graphs,Using First Derivatives to Find Maximum and Minimum Values and Sketch Graphs,Using Second Derivatives to Find Maximum and Minimum Values and Sketch Graphs, Graph Sketching
Week 13	Ellipses and hyperbola
Week 14	Conic sections, parabolas
Week 15	Review
Week 16	Preparatory Week Before The Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Calculus and Analytic Geometer/Thomson**	Yes
Recommended Texts	**Calculus and its applications Marvin L. Bittinger** **David J. Ellenbogen,Scott A. Surgent, Tenth EditionL 2012**	No
Websites		

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success	**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

Group(50 - 100)	**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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer programing1**			**Module Delivery**	
Module Type	Suport learning activity			☒**Theory** ☒**Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	WU22				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	UGI		**Semester of Delivery**	**One**	
Administering Department	Physics		**College**	College of science	
Module Leader	Haider Majid Tuma		**e-mail**	hmtuma@uowasit.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	1-6-2025		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Lab. of Computer	**Semester**	**1**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims	1. To describe the evolution of computer networks and the Internet; 2. To describe the difference between a computer network and a distributed system. 3. To explain the difference between LAN,MAN,WAN 4. To describe alternative networking approaches and topologies. 5. To describe Wired and Wireless configurations and deployments. 6. To explain the difference between wireless Communication Networks 7. To understanding of Network Management Systems and network security issues.
Module Learning Outcomes	Upon completion of the course, students should be able to: 1. Focus on information sharing and networks. 2. Use information and communication technologies. 3. Introduce flow of data, categories of network, different topologies. 4. Plan and install a network using real equipment and connect it to the Internet. 5. Choose the best topology to his application. 6. Describe the architectures of the typical network implementations such as the Internet, LAN, MAN, and WAN. 7. List the services provided Internet, LAN, MAN, and WAN. 8. Identify the guided and unguided media. 9. List the application of Internet, Intranet and Extranet. 10. Discuss the various properties of Network Design 11. Recognize the features of (2G, 3G, 4G, and 5G). 12. Summarize what is meant Network Management Systems. 13. Have a basic understanding of Network Management Systems and network security issues.
Indicative Contents	Indicative content includes the following. Telecommunication, data, Data communications definition and factors, data communications system components, Data Flow types, computer network uses, advantage, disadvantage, applications. [6 hrs] Network Criteria, Network configuration, Line Configuration, topology: (features, advantages, disadvantages and applications) [6 hrs] Categories of networks: PAN, LAN, MAN and WAN (features, uses and applications) [3 hrs] Transmission Media: Guided (twisted-pair cable, coaxial cable and fiber-optic cable), features, advantages and disadvantages, Unguided: (Infrared, Radio Waves, Satellite and Microwave), features, advantages and disadvantages [6 hrs] Internetworks concepts: Internet, Intranet and Extranet (advantages, disadvantages and applications), Network Design: (Delay, Packet Loss Ratio, Link Utilization, Throughput Models and Analysis), Wireless Communication Networks: (2G, 3G, 4G, and 5G): features, advantages and disadvantages [10 hrs] Network Management Systems (Standard Models, and enterprise implementations such as HPOV, Cisco IOS, etc), Research Topics and Projects (Traffic Modeling, QoS Routing, Secure Routing, Topology Discovery, and Performance Analysis) [3 hrs]

	Security in computer networks (Crypto Principles, Message integrity, Authentication, IPsec, SSL, Wireless security) [3 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Case study, Quizzes, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem)	64	**Structured SWL (h/w)**	4.27
Unstructured SWL (h/sem)	11	**Unstructured SWL (h/w)**	0.73
Total SWL (h/sem)	75		

Module Evaluation
تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (20)	3,5,6,10	LO #1,2,…..10
	Assignments	2	10% (10)	7, 8	LO # 8
	Seminar	1	10% (10)	11	LO # 11
Summative assessment	**Midterm Exam**	2 hr	10% (10)	12	LO # 1-12
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	• Part1: Chapter One: Computer Fundamentals, Computer Components.
Week 2	• Part1: Chapter Two: Computer Safety and software Licenses.
Week 3	• Part1: Chapter Three: Main operating systems
Week 4	• Part2: Chapter One: Introduction to Microsoft word + Quizzes1
Week 5	• Part2: Chapter Two: Insert Objects to Microsoft word, Editing Documents

Week 6	• Part2: Chapter Three: writing the equations
Week 7	• Part2: Chapter Four: Formatting Pages
Week 8	• Part3: Chapter One: Introduction to Microsoft Excel+ Quizzes2
Week 9	• Part3: Chapter Two: Additional Tasks in Microsoft word+ Midterm Exam
Week 10	• Part3: Chapter Three: Additional Tasks in Microsoft word+ Assignments
Week 11	• Part3: Chapter Four: Additional Tasks in Microsoft word
Week 12	• Part4: Chapter One: Introduction to Power Point+ Quizzes3
Week 13	• Part4: Chapter Two: Insert Objects and Add Animations in Microsoft Power Point+ Project
Week 14	• Part4: Chapter Three: Additional Tasks in Microsoft Excel Cont.
Week 15	• Part4: Chapter Four: Additional Tasks in Microsoft Excel Cont.
Week 16	• Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الأسبوعي للمختبر	
	Material Covered
Week 1	• Part1: Chapter One: Computer Fundamentals, Computer Components.
Week 2	• Part1: Chapter Two: Computer Safety and software Licenses.
Week 3	• Part1: Chapter Three: Main operating systems
Week 4	• Part2: Chapter One: Introduction to Microsoft word
Week 5	• Part2: Chapter Two: Insert Objects to Microsoft word, Editing Documents
Week 6	• Part2: Chapter Three: writing the equations
Week 7	• Part2: Chapter Four: Formatting Pages
Week 8	• Part3: Chapter One: Introduction to Microsoft Excel
Week 9	• Part3: Chapter Two: Additional Tasks in Microsoft word
Week 10	• Part3: Chapter Three: Additional Tasks in Microsoft word
Week 11	• Part3: Chapter Four: Additional Tasks in Microsoft word

Week 12	• Part4: Chapter One: Introduction to Power Point
Week 13	• Part4: Chapter Two: Insert Objects and Add Animations in Microsoft Power Point
Week 14	• Part4: Chapter Three: Additional Tasks in Microsoft Excel.
Week 15	• Part4: Chapter Four: Additional Tasks in Microsoft Excel.
Week 16	• Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	اساسات الحاسوب وتطبيقاته المكتبية	yes
Recommended Texts	Computer Organization and Design RISC-V Edition	yes
Websites	https://www.tutorialspoint.com/word/word_move_text.htm	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Human Rights and Democracy**			**Module Delivery**	
Module Type	**Suport learning activities**			☒ **Theory** ☒ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**WUO4**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	**UGI**	**Semester of Delivery**	1		
Administering Department	Physics	**College**	College of science		
Module Leader	Hassnein Farman Aboud Lafta	**e-mail**	h.farman@uowasit.edu.iq		
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.		
Module Tutor		**e-mail**			
Peer Reviewer Name		**e-mail**	None		
Scientific Committee Approval Date	1/06/2025	**Version Number**	1.0		

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 Objectives اهداف المادة الدراسية	A- Cognitive goals 1. Develop the ability to distinguish between different types of relationships between states and their citizens. 2. Understand the concept and principles of human rights. 3. Acquire knowledge and skills to address issues affecting human rights. 4. Gain a solid understanding of the origins and historical development of human rights. 5. Recognize the practical applications of human rights in real-life contexts. 6. Enhance students' ability to complete assignments effectively and meet deadlines. 7. Develop logical and critical thinking skills to address societal challenges, particularly issues such as domestic violence, cyber extortion, and drug abuse, and understand their impact on individuals and society. 8. Analyze the provisions of the Iraqi Constitution and evaluate its role in protecting and promoting human rights.
Module LearningOutcomes مخرجات التعلم للمادة الدراسية	1. Prepare graduates who are aware, educated, and conscious of their rights and responsibilities as individuals within society and the state. 2. Promote a culture of respect for others in society, regardless of differences in beliefs, attitudes, or personal backgrounds. 3. Encourage adherence to laws and regulations when addressing inappropriate behaviors or issues in the work environment. 4. Develop students' skills in dialogue, discussion, and constructive communication. 5. Enhance students' ability to analyze emerging social problems and propose appropriate solutions. 6. Strengthen students' knowledge and skills in preparing scientific reports.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Developing the student's ability to deal with societal problems. 2- Developing the student's ability to deal with the analysis of laws and the mechanisms of their application. 3- Developing the student's ability to deal with the multiple means available in the work environment. 4- Developing the student's ability to dialogue and discussion. 5- Developing the student's ability to employ his study tools as practical tools in the work environment. 6- Developing the ability to harmonize between the different conditions that prevail in the work atmosphere in proportion to the ability of the labor market to absorb the different conditions.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1- Managing the lecture in such a way that the student feels the importance of time.2- Assigning the student some group activities and duties. 3- Allocate a percentage of the grade for group activities. 4- Developing the topic of group campaigns that shed light on negative societal phenomena and the role of students as active individuals in society. 5- Active participation in the classroom is evidence of the student's commitment and responsibility. 6 Commitment to the deadline for submitting the assignments and reports requiredof the student to submit them. 7- Quarterly and final exams reflect commitment and knowledge and skillachievement.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعي	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (20)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	The nature of human rights.

Week 2	Human rights in Islam.
Week 3	Human rights in modern political thought.
Week 4	Human rights in contemporary political thought.
Week 5	Human rights in international conventions
Week 6	Human rights in the Iraqi constitution in force
Week 7	Midterm exam +Human rights violations in multiple experiences with the Universal Declaration of Human Rights
Week 8	Legal rights in the International Covenant on Civil and Political Rights
Week 9	Types of rights mentioned in the Iraqi constitution in force with the provisions of the Iraqi constitution related to rights and freedoms
Week 10	The historical development of the concept of democracy in the civilization of the Mesopotamia Greek civilization and Roman civilization.
Week 11	The difference between freedom and democracy
Week 12	Islamic views in the democratic system of government
Week 13	Forms of democracy and conditions for the success of the democratic system
Week 14	Elements and pillars of the democratic system
Week 15	**Preparatory week before the final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Human rights book, Dr. Taha Hamid Hassan	Yes
Recommended Texts	Human rights book, Dr. Hamid Hanoun	No
Websites	Human rights book by Dr. Riyad Al-Hadithi https://www.google.com/search?q=https%	

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
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Arabic Language I**			**Module Delivery**	
Module Type	**Suport learning activities**			☒ **Theory** ☐**Lecture** ☐**Lab** ☐**Tutorial** ☐**Practical** ☐**Seminar**	
Module Code	**WU01**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		UGI	**Semester of Delivery**		one
Administering Department		Physics	**College**	Science	
Module Leader	**Ahmed Abdulhamid Rasan**		**e-mail**	ahmedabd@uowasit.edu.iq	
Module Leader's Acad. Title		Lecture	**Module Leader's Qualification**		PhD.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1-6-2025	**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية أألخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات اإلرشادية	
Module Objectives أهداف المادة الدراسية	• Develop students' Arabic language proficiency to enable them to express ideas and projects clearly and confidently . تنمية الكفاءة اللغوية للطلبة بما يمكنهم من التعبير عن أفكارهم ومشاريعهم باللغة العربية بوضوح وطلاقة. • Promote the use of formal Arabic (Fusha) and minimize the use of colloquial or non-standard expressions. تعزيز استخدام اللغة العربية الفصحى والحد من استخدام اللهجة العامية أو الألفاظ غير العربية. • Strengthen students' writing skills in preparing accurate, coherent, and well-structured reports and essays. .تعزيز مهارات الكتابة لدى الطلبة في إعداد التقارير والمقالات بصورة دقيقة ومنظمة ومترابطة • Ensure proper application of Arabic grammar rules in both written and spoken communication. ضمان الاستخدام الصحيح لقواعد اللغة العربية في الكتابة والتحدث. • Improve the ability to read and comprehend academic texts in Arabic effectively. تطوير قدرة الطلبة على قراءة وفهم النصوص الأكاديمية باللغة العربية. • Enhance students' time management skills in completing and submitting assignments. تنمية قدرة الطلبة على إنجاز الواجبات وتسليمها ضمن الوقت المحدد

Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Upon completion of this course, students will be able to: عند إكمال هذا المقرر بنجاح، سيكون الطالب قادرًا على: 1. Demonstrate competence in reading, writing, and speaking Arabic effectively. إظهار كفاءة في القراءة والكتابة والتحدث باللغة العربية بشكل فعّال. 2. Communicate clearly in Arabic within academic and professional contexts. التواصل بوضوح باللغة العربية في البيئات الأكاديمية والمهنية. 3. Identify and interpret various linguistic and literary expressions. التعرف على التعبيرات اللغوية والأدبية المختلفة وتفسيرها. 4. Recognize the importance of Arabic language skills for academic and professional success. إدراك أهمية مهارات اللغة العربية لتحقيق النجاح الأكاديمي والمهني. 5. Apply critical thinking and problem-solving skills in practical situations. تطبيق مهارات التفكير النقدي وحل المشكلات في مواقف عملية. 6. Produce well-organized scientific reports using proper academic language. إعداد تقارير علمية منظمة باستخدام لغة أكاديمية سليمة. 7. - التعرف على مراحل التطور الادبي 8 - المقارنة بين الشعر العامودي و بين الشعر الحر
Indicative Contents المحتويات الإرشادية	Indicative Contents المحتويات الإرشادية Grammar (12 hours) Spelling (8 hours) Literature (6 hours) General Skills (4 hours) **رفع مستوى الطلبة من خلال التوجيه والارشاد وتحليل القصائد الشعرية والتعرف على اهم الاخطاء اللغوية وفهم البلاغة العربية بصورة ادق واوسع**

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Teaching and Learning Strategies استراتيجيات التعليم والتعلم • Deliver structured lectures focusing on key concepts and essential ideas. تقديم محاضرات منظمة تركز على المفاهيم الأساسية والأفكار الرئيسة • Highlight key terms and concepts to facilitate understanding. تحديد المصطلحات والمفاهيم الأساسية لتسهيل الفهم • Encourage active student participation through discussions and exercises. تشجيع مشاركة الطلبة الفعّالة من خلال المناقشات والتمارين • Provide opportunities for language practice in speaking and writing. توفير فرص للتدريب اللغوي في التحدث والكتابة • Offer continuous feedback to improve students' performance. تقديم تغذية راجعة مستمرة لتحسين أداء الطلبة

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

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 /Activities	1	10% (10)	Continuous	All
	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%		

Delivery Plan (Weekly Syllabus)

المنهاج الأسبوعي النظري

	Material Covered
Week 1	المشترك اللفظي
Week 2	البدل
Week 3	التوكيد
Week 4	المقامة
Week 5	الموشحات الاندلسية
Week 6	كتابة الاعداد
Week 7	العصور الادبية
Week 8	الاستثناء في اللغة العربية
Week 9	Mid exam
Week 10	الفرق بين الضاد والظاء والسين وسوف:الاملاء
Week 11	كتابة قواعد كتابة اللف في نهاية الكلمة الاملاء:

Week 12	الشاعر الجواهري حياته ودواوينه تحليل قصيدة (يا دجلة الخير):الأدب
Week 13	المبتدأ والخبر في اللغة العربية
Week 14	المدارس الشعرية الحديثة
Week 15	مواضع تقديم الخبر في اللغة العربية
Week 16	التهيؤ للامتحان النهائي

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	الكتاب المنهجي المقرر من الوزارة	Yes
Recommended Texts		
Websites	محاضرات خاصة بالموضوع / كتب وبحوث وتقارير	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Academic English 1**			**Module Delivery**	
Module Type	**Suport learning activities**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**WU02**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		UGI	**Semester of Delivery**		Two
Administering Department		Physics	**College**	Science	
Module Leader			**e-mail**		
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		PhD.
Module Tutor	Hassanein Rahim Abd Matrood		**e-mail**	husnen.abd@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1-2-2026	**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسيةالاخرى			
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 اهداف المادة الدراسية	1. To prepare the students for careers and higher education. 2. To value teaching that will lead our students to participate in society. 3. To develop the students to have an awareness of theoretical perspectives in the teaching of physics. 4. To equip the students with manners, etiquettes and soft-skills. 5. To train the students for teaching English as a second language using the different modern technologies in language learning and teaching. 6. To promote students' creativity, self-assessment, and critical thinking skills. 7. To inculcate aesthetic sense and human values among the students
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Understanding the target language in terms of meaning and structure, in addition to pronunciation. 2. Developing basic language skills that enable the use of introductory-level vocabulary. 3. Developing understanding and the ability to use communicative language in daily life.
Indicative Contents المحتويات الارشادية	• Writing a simple, grammatically correct sentence that the student can use to describe people, express a desire or point of view, etc. • Understanding and comparing simple reading passages. • Daily multiple-choice quizzes.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Classroom education through theoretical and practical lectures. 2. Preparing scientific reports and research

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	37	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.47
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	13	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.87
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	8	All
	Assignments	1	10% (10)	3	all
	Activates	1	10% (10)	4	all
	Presentation	1	20% (10)	13	all
Summative assessment	Midterm Exam	2 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction Hello, Vocabulary, Everyday English
Week 2	Unit one:Questions words What...? Which...? and so on...
Week 3	Questions words Who...? Why...? How much. and so on…
Week 4	Unit Two:Tenses (Simple present tense) Positive and Negative Forms
Week 5	Tenses (Present Continuous) Positive and Negative Forms,have/have got
Week 6	First Exam-Reading and listening
Week 7	Unit Three:Past simple tense,Positive and Negative Forms
Week 8	Unit four:Quantity,Much and Many
Week 9	Articles:Definite and indefinite articles
Week 10	Unit Five:Verb patterns 1,Verbs followed by a to-infinitive
Week 11	Future intentions

Week 12	Unit Six:Comparative and superlative adjectives
Week 13	Tell me! What's it like?
Week 14	Review
Week 15	Preparatory Week Before the Final Exam
Week 16	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	New Headway Plus- student's book + workbook by John and Liz Soar	Yes
Recommended Texts	New Headway. Elementary. Student's book. Liz and John Soars	No
Websites	https://learnenglish.britishcouncil.org/english-grammar-reference/present-simple https://www.ef.com/wwen/english-resources/english-grammar/present-perfect	

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Magnetism**			**Module Delivery**	
Module Type	**Core learning activity**			☐ ☒ **Theory** ☐ ☒ **Lecture** ☐ ☒ **Lab** ☐ ☐ **Tutorial** ☐ ☐ **Practical** ☐ ☐ **Seminar**	
Module Code	**Phy-122**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	UGI		**Semester of Delivery**	2	
Administering Department	Physics		**College**	Science	
Module Leader	Asst.Prof.Dr. Ghada Ayad Kadhim		**e-mail**	gayad@uowasit.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	------		**e-mail**	------	
Peer Reviewer Name	-------		**e-mail**	-------	
Scientific Committee Approval Date	1/03/2026		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Phy-112	**Semester**	1
Co-requisites module	Lab of Magnetism	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Enable the student to know the basics of magnetism. 2. The student's knowledge of magnetic poles and the forces that deal with them. 3. Enable the student to analyze electrical circuits and the basic elements of the coiled and capacitance circuit. 4. Analyzing electrical circuits mathematically. 5. Practical application of theoretical material in the laboratory.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing the Semester, the student will be able to: 1. Know what are magnets and magnetic force. 2. Know the laws of static magnetic field and use them to solve problems and related applications. 3. Know Lorenz's law and how to determine the vector of force, velocity and current. 4. Explain and calculate the results of applying magnetic fields to magnetizable materials such as restricted current magnetic field inside the material. 5. Uses computer software to simulate a specific magnetic phenomenon 6. Demonstrates the ability to learn continuously and works alone or in a team
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Theoretical basis of Magnetism What is the magnet, magnetic poles and its different forms, the emergence of magnetic lines and knowledge of its characteristics. [13 hrs] Explain the magnetic field and determining the direction of the magnetic force in relation to the velocity and the direction of the field according to the rule of the left and right hands, depending on the type of charge entering the magnetic field. [15 hrs] Deriving the magnetic force and its theoretical basis and explain Faraday's law with examples and exercises. [10 hrs] Explain the most important applications that include magnetic and electric forces, as in the velocity selector device and the mass spectrometer. [13 hrs] Explain the capacitance and resistance circuits and the derivation of charge and current in the case of charging and discharging. [10 hrs] Part B – electromagnetism Know the most important concepts of Maxwell's theory. [10 hrs] Explain the electric field, the magnetic field, and the derivation of the velocity of electromagnetic waves. [15 hrs]

	Deriving the intensity of electromagnetic waves and explaining their theoretical basis. [12 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. 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 critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. 2. Make the student able to use the devices in the electrical laboratory and carry out experiments. 3. The student should be able to prepare reports on laboratory experiments and discuss the results.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	94	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.27
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	81	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.40
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	----------
	Assignments	2	10% (5)	2, 12	----------
	Projects / Lab.	1	10% (10)	Continuous	----------
	Report	1	10% (5)	13	----------
Summative assessment	Midterm Exam	2 hr	10% (10)	7	----------
	Final Exam	3hr	50% (60)	16	----------
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Magnetism
Week 2	Magnetic Field Lines
Week 3	Magnetic Flux Density
Week 4	Origin of Magnetic Fields
Week 5	Magnetic Force on Moving Charge
Week 6	Direction of Magnetic Force
Week 7	Exam
Week 8	Forces on Negative Charges

Week 9	The Velocity Selector
Week 10	Mass Spectrometer
Week 11	Application of Faraday's Law
Week 12	Energy Density
Week 13	RC Circuit
Week 14	Maxwell's Theory
Week 15	Electro magmatic wave Intensity and Distance
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: **capacitors Connect series and parallel**
Week 2	Lab 2: **Calculate the potential difference and the total charge of the circuit**
Week 3	Lab 3: **The internal resistance of the ammeter**
Week 4	Lab 4: **CRO cathode oscilloscope**
Week 5	Lab 5 **Achieve Stefan's law of radiation**
Week 6	Lab 6:**Research the relationship between the current passing through a tungsten filament and the voltage applied to it**
Week 7	Lab 7: **Study the(current-voltage) characteristics of diode**
Week 8	Lab8: Preparatory Week Before The Final Exam
Week 9	Lab9: Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Electricity and Magnetism 3rd Edition by Edward M. Purcell	Yes
Recommended Texts	Electromagnetic waves and Transmission Lines by R.S.Rao..	No
Websites	https://byjus.com/physics/electricity-and-magnetism/	

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Computer programing II**			**Module Delivery**	
Module Type	**Suport learning activity**			☒**Theory** ☒**Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**WU22**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level		UGI	**Semester of Delivery**		2
Administering Department		Physics	**College**	College of science	
Module Leader	Haider Majid Tuma		**e-mail**	hmtuma@uowasit.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1-3-2026	**Version Number**		1.0

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	WUO3	**Semester**	1
Co-requisites module	Lab.of computer	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Objectives أهداف المادة الدراسية	1. Giving the student a general idea of computer material at a study environment, library, and at home. 2. Understanding the basic rules for dealing with and managing computers (computer basics, computer components, computer and software licenses, operating systems), With the aim of preparing the student to enter the programs he needs in the department. 3. Giving the student knowledge about the office applications as basic principles for students in the College of Engineering.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Knowing computer peripherals, their connections and Windows system. 2. Distinguish between the important tabs in the Word program. 3. The ability to write an entire paragraph with formatting. 4. Understand the basics of power point program. 5. Understand the excel sheet program.
Indicative Contents المحتويات الإرشادية	Part A (9 hr) Introduction to computer principles. Part B (12 hr) MS Word program. Part C (12 hr) MS Excel program. Part D (12 hr) MS Power Point program.

Learning and Teaching Strategies استراجيات التعلم والتعليم	
Strategies	1. Using computers and display screens to explain lectures to students to increase students' mental comprehension. 2. Practical applications in the computer lab of what was explained in the theoretical lecture. 3. Using direct questions in the classroom as brainstorming skills. 4. Encouraging students to solve class and homework assignments and to perform specialized reports.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	27	**Unstructured SWL (h/w)** الحمل الدراسي الغير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (15)	4, 8, 12	All
	Assignments	1	5% (5)	10	All
	Lab.	15	15% (15)	Continuous	All
	Projects	1	5%	13	/
Summative assessment	Midterm Exam	2hr	10% (10)	9	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	• Part1: Chapter One: Fundamentals of programing languages and MATLAB.
Week 2	• Part1: Chapter Two: Essential commands, scripts, matrix representations
Week 3	• Part1: Chapter Three: Debugging codes and simple programs codes + Quiz 1
Week 4	• Part2: Chapter One: Loops in MATLAB and summing a series with a for loop
Week 5	• Part2: Chapter Two: mathematical procedures with the for loops
Week 6	• Part2: Chapter Three: logic and the if statements + assignment
Week 7	• Part2: Chapter Four: Simple programs using the if and for loops + while loops+ project
Week 8	• Part3: Chapter one: introduction to grids and plots + linear plotting
Week 9	• Part3: Chapter two: plotting functions + plot appearance
Week 10	• Part3: Chapter three: Multiple plots + common functions plots+ writing plotting codes+ assignment
Week 11	• Part4: Chapter One: Linear and systems of nonlinear equations in MATLAB + Quiz 2
Week 12	• Part4: Chapter Two: Introduction to derivatives and integrals with MATLAB
Week 13	• Part4: Chapter Three: Introduction to solving ODEs in MATLAB

Week 14	• Part4: Chapter Four: Solving ODEs numerically in MATLAB +MATLAB DEs solvers + project
Week 15	• **Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الأسبوعي للمختبر

	Material Covered
Week 1	• Part1: Chapter One: Fundamentals of programing languages and MATLAB.
Week 2	• Part1: Chapter Two: Essential commands, scripts, matrix representations
Week 3	• Part1: Chapter Three: Debugging codes and simple programs codes + Quiz 1
Week 4	• Part2: Chapter One: Loops in MATLAB and summing a series with a for loop
Week 5	• Part2: Chapter Two: mathematical procedures with the for loops
Week 6	• Part2: Chapter Three: logic and the if statements + assignment
Week 7	• Part2: Chapter Four: Simple programs using the if and for loops + while loops+ project
Week 8	• Part3: Chapter one: introduction to grids and plots + linear plotting
Week 9	• Part3: Chapter two: plotting functions + plot appearance
Week 10	• Part3: Chapter three: Multiple plots + common functions plots+ writing plotting codes+ assignment
Week 11	• Part4: Chapter One: Linear and systems of nonlinear equations in MATLAB + Quiz 2
Week 12	• Part4: Chapter Two: Introduction to derivatives and integrals with MATLAB
Week 13	• Part4: Chapter Three: Introduction to solving ODEs in MATLAB
Week 14	• Part4: Chapter Four: Solving ODEs numerically in MATLAB +MATLAB DEs solvers + project
Week 15	• **Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Ross L. Spencer, Introduction to MATLAB	yes
Recommended Texts	Russell, S., & Norvig, P. (2021/2024). Artificial Intelligence: A Modern Approach (4th ed.). Pearson. Bishop, C. M. (2006). Pattern Recognition and Machine Learning. Springer.	yes
Websites	https://www.tutorialspoint.com/word/word_move_text.htm	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics II**			**Module Delivery**	
Module Type	**Basic learning activity**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-123**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGI		**Semester of Delivery**	2	
Administering Department	Physics		**College**	Sciences	
Module Leader	Najwa Jassim Jubier		**e-mail**	njassim@uowasit.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2025		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-113	**Semester**	1
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. Mathematics is a fundamental part of human thought and logic, and integral to attempts at understanding the world and ourselves. 2. Mathematics provides an effective way of building mental discipline and encourages logical reasoning and mental rigor. 3. In addition, mathematical knowledge plays a crucial role in understanding the contents of other subjects such as the science of physics. 4. Providing learners with knowledge of the importance of mathematics in the field of physics 5. Developing positive attitudes regarding this knowledge of mathematical equations and methods that are useful to physicists in a theoretical way. 6. Learn about types of integration and their methods. 7. Recognizing the basic concepts of mathematics. 8. Identify the stages of development of mathematics and the importance of mathematical transformations and their future use in physics 9. As well as introducing students to the integral of functions and their applications in physics. 11. Introducing students to the integration of functions, their methods, and applications 12. Introducing students to sequences and series.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Integrate the domain of concepts and knowledge from mathematics into the practical application of physics phenomena, and the development of abilities and skills to solve example problems. 2. Know the methods of the integral of functions. 3. Identify the type of equations used in physical measuring devices 4. Comparison between mathematics and physics in terms of laws, use, and usefulness. 5. Learn about basic mathematical methods and study the methods of integration and their applications 6. Identifying mathematical functions and algebra and linking their importance to physicists. 7. Analyze the results mathematically.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A – Differentiation of Hyperbolic Functions Inverse trigonometric Functions and Their Derivatives

	Integral, The Idea of the Integral, definite integrals, Properties of definite integrals, Integral of Exponential and Logarithmic Functions, Integral of the Trigonometric functions. Integration of Hyperbolic Functions ,Integration of inverse trigonometric Functions Part B – Techniques of Integration Integration by Parts, Trigonometric Integrals, Trigonometric Substitutions Partial Fractions. Improper Integrals, Applications of the Integral(Areas and Volumes) Vectors Vectors in the Plane, Definitions and Laws of Vector Algebra, equation of the straight line in space Sequences and series definition of sequence, infinite series, Geometric series, common Convergence Tests - Comparison Test , Integral, The Taylor Series for e^x, sin x, and cos x Power Series ratio of the nth root. Revision problem classes

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy adopted in delivering this module is to actively engage students in the learning process through continuous participation in class activities and exercises, while simultaneously developing and enhancing their critical thinking skills. This will be achieved through a combination of lectures, interactive tutorials, and simple practical activities that stimulate students' interest. In addition, students will be regularly assessed through assignments, quizzes, and daily participation to reinforce their understanding, encourage consistent engagement, and provide ongoing feedback on their academic progress.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**78**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
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
	activites	5	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction, Differentiation of Hyperbolic Functions
Week 2	Inverse trigonometric Functions and Their Derivatives

Week 3	Integral, The idea of the Integral, definite integrals, Properties of definite integrals, , Indefinite integrals
Week 4	Integral of Exponential and Logarithmic Functions and other functions
Week 5	Integral of the Trigonometric functions
Week 6	Integration of Hyperbolic Functions
Week 7	Integration of inverse trigonometric Functions
Week 8	Mid-term Exam
Week 9	Techniques of Integration
Week 10	Integration by Parts, Trigonometric Integrals, Trigonometric Substitutions
Week 11	Vector, Vectors in the Plane, Definitions and Laws of Vector Algebra, equation of the straight line in space
Week 12	Sequences and series, definition of sequence, infinite series
Week 13	Geometric series, common Convergence Tests - Comparison Test
Week 14	Integral, ratio of the nth root ,The Taylor Series for e^x, sin x, and cos x,Power Series
Week 15	Review
Week 16	The preparatory week before the Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Calculus and Analytic Geometer/Thomson	Yes
Recommended Texts	Calculus and its applications Marvin L. Bittinger David J. Ellenbogen,Scott A. Surgent, Tenth EditionL 2012	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Properties of Matter**			**Module Delivery**	
Module Type	**Core learning activity**			☐ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-121**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	**UGI**		**Semester of Delivery**	2	
Administering Department	Physics		**College**	Sciences	
Module Leader	Khudhair Abbas Assaf		**e-mail**	kassaf@uowasit.edu.iq	
Module Leader's Acad. Title	Assist Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	8/03/2026		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-111	**Semester**	1
Co-requisites module	Lab.of mechanics	**Semester**	2

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop problem solving skills and understanding the properties of matter 2. To understand Elasticity. 3. This course deals Fluid at rest 4. To deal with pressure in fluid of uniform density and varies density 5. To understand Buoyancy, Continuity Equation and Bernoulli Equation. 6. To analysis Traveling waves and Standing waves.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Dealing with type of stress and strain. 2. Studying the Atmospheric pressure and Gauge pressure. 3. Understanding the Pascal law, Archimedes' principle and surface tension 4. Dealing with The Continuity Equation in confined fluids 5. Understanding the interference between waves
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Elasticity, direct stress, direct strain, Modulus of elasticity, ultimate tensile stress, shear stress and strain, ultimate shear stress, Modulus of rigidity and double shear [10 hrs] Fluid mechanics, pressure, Variation of pressure with depth in a fluid of constant density, Pressure at a Depth for a Fluid of Constant Density, Atmospheric Pressure, Variation of atmospheric pressure with height and Pascal law [10 hrs] Revision problem classes [6 hrs] Part B - Surface tension, Capillarity, Capillary Action, Capillary Pressure. [6 hrs] The density, Buoyancy, Archimedes' principle, Fluid Flow, Continuity equation, Bernoulli Equation [8 hrs] Traveling waves, interference waves, Standing waves [8 hrs] Revision problem classes [4 hrs]
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 critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**94**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**6.4**
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**81**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**5.4**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**175**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	3	10% (10)	4,7, 10	LO #1, 2, 10 and 11
	Assignments	1	10% (10)	12	LO # 3, 4, 6 and 7
	Projects / Lab.	6	10% (10)	Continuous	All
	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	Direct Stress- strain
Week 2	Modulus of rigidity and double shear
Week 3	shear stress and strain
Week 4	Fluid Mechanics
Week 5	Atmospheric and gauge pressure
Week 6	Variation of atmospheric pressure with height and Pascal law
Week 7	Fluid flow
Week 8	**Midterm exam**
Week 9	Surface Tension
Week 10	Capillary action
Week 11	Buoyancy
Week 12	Archimedes' Law
Week 13	Traveling waves
Week 14	interference waves
Week 15	Standing waves
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Measurement of Viscosity of a Liquid by Stokes Law
Week 2	Lab 2: Measurement the coefficient of surface tension of liquid by capillary tube
Week 3	Lab 3: Measurement the density of liquid
Week 4	Lab 4: The balance of power
Week 5	Lab 5: Spin radius of a cylinder rolling down on an inclined surface
Week 6	Lab 6: Determine the surface tension of a given liquid Using stalagmometer by drop number method
Week 7	Lab 7: Exam:

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts		
Recommended Texts	Classical mechanics John r. Taylor	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**General Astronomy**			**Module Delivery**	
Module Type	**Basic learning activity**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-124**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level		UGI	**Semester of Delivery**		2
Administering Department		Physcics	**College**	sciences	
Module Leader	Khudhair Abbas Assaf		**e-mail**	kassaf@uowasit.edu.iq	
Module Leader's Acad. Title		Assist Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1/03/2026	**Version Number**		1.0

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. To develop problem solving skills and understanding of general astronomy 2. To understand spherical geometry. 3. This course deals determining the position of the celestial objects. 4. To study the physical properties of the Sun and Moon . 5. Studying the properties of the solar system. 6. To study the Milky Way and other galaxies.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understanding the geometry of spherical triangles. 2. Understanding how to use astronomical coordinate system to determine the position of objects in the sky. 3. Summarize the astronomical units. 4. Describe the solar system. 5. Understanding some of the physical properties of the Sun and Moon. 6. Define Bude low. 7. Understanding the properties of stars. 8. Discuss the evolution of star. 9. Discuss type of stars. 10. Explain the type of galaxies.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A – General Astronomy</u> General astronomy- Kepler's laws. The geometry of sphere. Celestial sphere . Defining some spherical terms. Defining some astronomical parameters. Studying some mathematical forms. Astronomical coordinate systems. Transformation of one coordinate system into another [24 hrs] The Sun, studying some physical properties of the sun. The Moon. Explain some physical properties of the moon, the periods of the Moon. The planets. Studying the physics of eight planets. Bude low, the origin of the solar system.[20 hrs] Revision problem classes [6 hrs] <u>Part B –Stars and Galaxies</u> Understanding the stellar magnitude. Brightness. Luminosity. Some physical properties of stars. Movement of star. Classification of star. Understanding of stellar evolution. life time of star. HR- diagram [20 hrs] Type of stars. Classification of stars. Determining of some physical properties of stars. Binary and Multiple Star Systems. Variable stars [16 hrs] Galaxies. Type of galaxies. the component of our galaxy the milky Way[8 hrs] Revision problem classes [6 hrs]

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 critical thinking skills. This will be achieved through classes, interactive tutorials.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.1
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**	3	10% (10)	4, 7,10	LO #1, 2, 10 and 11
	presentation	1	10% (10)	12	LO # 3, 4, 6 and 7
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO # 1-7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Kepler's laws
Week 2	Spherical Geometry and Spherical trigonometry
Week 3	Celestial sphere
Week 4	Coordinate systems
Week 5	Transformation of one coordinate system into another
Week 6	The astronomical units
Week 7	The Sun
Week 8	The Moon
Week 9	Stellar magnitude
Week 10	Stellar Motion and Stellar distance
Week 11	Hertzsprung - Russell diagram
Week 12	Stellar Evolution
Week 13	Binary and Multiple Star Systems
Week 14	Variable stars
Week 15	Galaxies and Our galaxy (Milky Way)
Week 16	**Preparatory week before the final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	فيزياء الجو والفضاء : الجزء الاول (علم الفلك) – حميد مجول النعيمي وفياض النجم	Yes

Recommended Texts	Astronomy: Principle and Practice A.E. Roy, D. Clarke	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.

Second Stage

General &Medical Physics

MODULE DESCRIPTION
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**MathematicsIII**			**Module Delivery**	
Module Type	Basic learning activities			☒ **Theory** ☒**Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-215**				
ECTS Credits	**4**				
SWL (hr/sem)	**125**				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	Physics		**College**	Science	
Module Leader	Najlaa Jerjack Abdullah Karmsh		**e-mail**	njerjack@uowasit.edu.iq	
Module Leader's Acad. Title	Asst. Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	1/6/2025		**Version Number**		

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	**PHY-123**	**Semester**	2
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. This course deals with the basic concepts and definitions related to differential and integration and its applications in physics. 2. Studying mathematical material related to the study of physics by focusing on important concepts and functions Used in physics. 3. Study complex numbers and some theorems related to it. 4. To solve mathematical problems related to integrations.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Recognize different definitions related to complex numbers. 2. Recognize Type of integration. 3.Discuss the derivative of functions 4. .Discuss the integration of functions 5.understand the integral of trigonometric functions 6.know Exponential functions 7.Define Grammars role 8. Identify the basic integral exponential functions and their applications.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Introduction to complex numbers , Properties of complex numbers , Polar form of complex numbers, De Moivre's theorem, Euler's formula [14 hrs.] Differentiation, Basic Rules of Integration, Integration by Substitution, Integration of Rational Functions by Partial Fractions and solving a group from exercises [14 hrs.] Revision problem classes [3hrs] Part B – application Complex numbers, Polar form of complex numbers, De Moivre's theorem, Euler's formula [13 hrs.] Differentiation, Basic Rules of Integration, Applications of integration in physics [13 hrs.]

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, using concepts in math vocabulary, meaningful and frequent homework to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**27**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**1.8**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**75**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	10% (10)	Continuous	All
	Report	2	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	20% (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	Complex numbers
Week 2	Properties of complex numbers
Week 3	Polar form of complex numbers
Week 4	De Moivre's theorem
Week 5	Euler's formula
Week 6	solving a group from exercises
Week 7	Midterm Exam

Week 8	Differentiation
Week 9	Basic Rules of Integration
Week 10	solving a group from exercises
Week 11	Integration by Substitution
Week 12	Integration by Parts
Week 13	Trigonometric Integration
Week 14	Integration of Rational Functions by Partial Fractions and solving a group from exercises
Week 15	Applications of integration in physics
Week 16	**Preparatory Week Before The Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Calculus	Yes
Recommended Texts	MATHEMATICAL METHODS FOR PHYSICISTS MATHEMATICAL METHODS IN THE PHYSICAL SCIENCES	No
Websites	https://www.wolframalpha.com/	

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.

MODULE DESCRIPTION
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Modern Physics I**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-211**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	Physics		**College**	Sciences	
Module Leader	Muneer Hlail Jadua'a ALzubaidy		**e-mail**	malzubaidy@uowasit.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	1/6/2025		**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Lab. of Modern Physics	**Semester**	3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. Provide simple and clear explanations of the main physical concepts and theories of the twentieth century. 2. . Illustrate these concepts and theories through a wide range of current applications and examples and activate the text with brief drawings of the historical development of physics in the twentieth century. 3. . Make the student understand how thinking has evolved around the need to find scientific explanations for some physical phenomena that did not have a clear scientific explanation. 4. . Make the student understand the development of the concept of atomic models. 5. . Develop an understanding of the current basis of broad knowledge in modern physics. 6. . Promote critical thinking, analytical reasoning and problem-solving skills. 7. . Discuss the problems facing modern physics in the twenty-first century.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Review the units that will be used to understand modern physics and clarify some of the basic concepts that the student needs to understand the atom. 2. Identify the most important physical problems and phenomena that lacked scientific explanation. 3. Learn about atomic models and develop an understanding of the atom. 4. Identify the components of corn and their quantitative values. 5. Knowing the spectral series of the hydrogen atom and how to calculate the frequencies of the radiation emitted by the atom. 6. Recognize Quantitative numbers, Pauli's exclusion principle , Quantum theory of the hydrogen atom , Angular momentum of electrons, orbital angular momentum and electron spin. 7. Identifying the types of spectra and their sources 8. Get basic concepts about X-ray , how it is generated, and types of X-ray spectra. 9. To learn about the radiation emitted by materials and to gain knowledge to study it.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Units, Modern Physical Concepts, Atomic Models, Spectral Series, Calculation of Emitted Spectra from an Atom [14 Hours] Atomic Components, Quantum Values and Review Problems [14 Hours] Review Problem Chapters [3 Hours] Part B – Application Quantitative numbers, Pauli's exclusion principle , Quantum theory of the hydrogen atom , Angular momentum of electrons, orbital angular momentum and electron spin. The types of spectra and their sources [14 Hours] X-ray , how it is generated, and types of X-ray spectra [14 Hours] the radiation emitted by materials and to gain knowledge to study it[14 Hours]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in presenting this module is to encourage students' participation in explaining the daily lecture, clarifying modern physics concepts by comparing these concepts with what is around us in nature, and using meaningful and repetitive homework to encourage students to participate in the exercises and understand exercises and how to apply them, while at the same time refining and expanding students' scientific thinking skills.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**79**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.27**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**71**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**4.73**
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)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	2	10% (10)	Continuous	All
	Report	2	20% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Atomic models
Week 2	Quantitative numbers, Pauli's exclusion principle
Week 3	Quantum theory of the hydrogen atom

Week 4	Zeeman effect, Applications
Week 5	Atomic spectra
Week 6	Hydrogen atom spectrum series
Week 7	Midterm Exam
Week 8	Molecular spectra
Week 9	Boltzmann distribution
Week 10	Rotational spectrum, vibrational spectrum
Week 11	X-rays, continuous and sharp spectrum
Week 12	Continuous and sharp spectrum
Week 13	the radiation emitted by materials blackbody radiation)
Week 14	Rayleigh and Jeans' explanation of blackbody radiation
Week 15	Planck's explanation of blackbody radiation
Week 16	**Preparatory Week Before The Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Measurement of Electron Charge-to-Mass Ratio**
Week 2	**Electron (or Positron) Absorption in Matter**
Week 3	**Backscattering of Beta Particles**
Week 4	**Emission Spectrum of a Cathode Lamp**
Week 5	**Photoelectric Cell and Linear Attenuation Coefficient of Light**
Week 6	**Line Spectra and Rydberg Constant**
Week 7	**Franck–Hertz Experiment**
Week 8	**Hall Effect in Semiconductors**
Week 9	**Review of Previous Experiments**
Week 10	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**مفاهيم في الفيزياء الحديثة ، تاليف ارثر بايزر – ترجمة : د.عبد المنعم مشكور د.شاكر جابر شاكر**	Yes
Recommended Texts	**Modern Physics , Uttarakhand Open University, Haldwani, Nainital- 263139**	No
Websites	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.uou.ac.in/sites/default/files/slm/BSCPH-302.pdf	

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.

MODULE DESCRIPTION
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Numerical analysis**			**Module Delivery**	
Module Type	**Basic learning activities**			☒ **Theory** ☐ **Lecture** ☒**Lab** **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**WU22**				
ECTS Credits	**3**				
SWL (hr/sem)	**75**				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	Physics		**College**	Sciences	
Module Leader	Mutasim Ibrahim Malik		**e-mail**	mutasim@uowasit.edu.iq	
Module Leader's Acad. Title	Assist.Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	01/06/2025		**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Lab. of Numerical analysis	**Semester**	3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. This course deals with the how to get numerical solutions for polynomial differential equations, integration and curve fitting 2. Enabling the student to write a program that describes all these numerical analysis issues, 3. as well as building the student's ability to develop the skill of dealing with numbers to find solutions with the least errors, 4. then comparing the solutions he reached with the analytical solutions, as well as discussing the causes of the error.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Make the student able to solve numerical analysis problems in a shorter time and with few or no errors. 2. Make the student able to formulate the problems and ideas of this subject in the form of programs that can change the inputs to obtain the outputs and comparison. 3. Make the student able to distinguish between each method and compare them as well as calculate the error for each method and know the reasons for the error. 4. Make the student able to deal with new ideas within this field as well as find solutions for them. Make the student able to apply these ideas in similar situations and develop appropriate solutions for them.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Main computers components Flowchart and algorithm, Solution of equation with one variable Fixed point Iteration Method, Bisection Method, false position method, Secant method(14hrs), Revision problem classes [3hrs] … Numerical solution of ordinary differential equation, Euler method, Improve Euler method, Runge-kutta method, Integration ,rectangular method, Integration ,rectangular method. Trapezoidal, method Simpsons rule Curve fitting, least square criteria, least square linear Least square parabola Least square exponential.(14hr),

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, using concepts in numerical analysis vocabulary, meaningful and frequent homework to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	12	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	0.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Quizzes / Lab.	2	10% (10)	Continuous	All
	Report / Lab.	2	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	Main computers components Flowchart and algorithm
Week 2	Solution of equation with one variable Fixed point Iteration Method
Week 3	Bisection Method
Week 4	false position method
Week 5	Newton-raphson method
Week 6	Secant method
Week 7	Midterm Exam

Week 8	Numerical solution of ordinary differential equation, Euler method
Week 9	Improve Euler method
Week 10	Runge-kutta method
Week 11	Integration ,rectangular method
Week 12	Trapezoidal method
Week 13	Simpsons rule
Week 14	Curve fitting, least square criteria, least square linear
Week 15	Least square parabola
Week 16	Least square exponential.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Introduction to numerical analysis	Yes
Recommended Texts	An introduction to numerical analysis second edition, kendall E. Atkinson, john wiley&sons	No
Websites	https://faculty.ksu.edu.sa/sites/default/files/numerical_analysis_9th.pdf	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Analog Electronic**			**Module Delivery**	
Module Type	**Core learning activity**			☐ **Theory** ☒**Lecture** ☒**Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-214**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGII**	**Semester of Delivery**		**3**
Administering Department		Physics	**College**	Sciences	
Module Leader	Ahmed Abdul Mahdi Abdul Kareem		**e-mail**	aalamahdi@uowasit.edu.iq	
Module Leader's Acad. Title		Lecturer	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	aalamahdi@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		1/06/2025	**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Lab. of Analog Electronic	**Semester**	3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	The course aims to provide students with information and skills about semiconductor materials, their properties, methods of measurement, and their applications that benefit the student at the advanced university level, which can qualify him for postgraduate studies in the physical sciences, and to build a strong background for those who will continue in the specialization of solid-state physics and materials.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1- Enable the student to identify the division of solid materials in terms of electrical conduction 2- Enable the student to identify the physical properties of semiconductor materials, especially silicon and germanium 3- Learn how to obtain a positively charged semiconductor junction (N-type) 4- Learn how to obtain a negatively charged semiconductor junction (P-type) 5- Learn the physical properties of the N-P junction or what is called a diode 6- Learn about the applications of the diode and its benefit in electrical circuits 7- Learn about the physical properties of the transistor or what is called the N-P-N
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Conductors, Semiconductors, Insulators, Covalent bonds, valence electrons , Properties of Silicone Material, Properties of Germanium Material, valence band and conduction band, Meaning of Holes and Electrons, n-type semiconductor, p-type semiconductor, n-p junction (Diode), Properties of Diode, n-p-n junction (transistor), p-n-p junction (transistor), Bipolar Junction Transistor (BJT), properties of transistors, Common Base Connection properties, Common Emitter Connection properties, Common Collector Connection properties. Part B – application Half-Wave Rectifiers, Half-Wave Rectifiers With Center Taped Transformer, Full-Wave Rectifiers With Transformer, Full- Wave Bridge Rectifiers, Filters, Different Types of Half and Full Wave Clippers or Diode Limiters.

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, using concepts in analog electronic vocabulary, meaningful and frequent homework to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.7
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)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	2	20% (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	The energy band in solid materials
Week 2	Intrinsic semiconductor,
Week 3	Extrinsic semiconductor
Week 4	The Diode
Week 5	The diode equations, V-I characteristic
Week 6	Diode applications: 1-Half -wave rectifiers
Week 7	2-Full -wave rectifiers
Week 8	3- Filters

Week 9	The bipolar junction transistor (BJT)
Week 10	Current and Voltage Analysis
Week 11	Common Base Configuration
Week 12	Common Emitter configuration
Week 13	Common Collector Connection
Week 14	Limits of Operation
Week 15	Linear Operation
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Acquaint students with the knowledge of laboratory Analog Electronic and devices used in the laboratory, and how to write reports after conducting experiments
Week 2	Diode Characteristics
Week 3	Rectifier Circuits
Week 4	Clipping and Clamping Circuits
Week 5	The Zener Diode
Week 6	Light Emitting Diodes (LEDs)
Week 7	BJT Characteristics
Week 8	Transistor DC Biasing
Week 9	Logic Gate Circuits
Week 10	Final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Electronic principle 8th edition by albert malvino	Yes
Recommended Texts	1- Electronic Devices 7th edition by Thomas L. Floyd 2- Electronic Devices and Circuit Theory 7th edition by Robert L. Boylestad	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.

MODULE DESCRIPTION
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	English language II			**Module Delivery**	
Module Type	**Suport learning activities**			☒ **Theory** ☒**Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**WU23**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level		**UGII**	**Semester of Delivery**		3
Administering Department		Physics	**College**	Sciences	
Module Leader	Dr.Husnen R. Abd		**e-mail**	husnen.abd@uowasit.edu.iq	
Module Leader's Acad. Title		Lecture	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		1/02/2026	**Version Number**		1.0

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	NONE	**Semester**	NONE
Co-requisites module	NONE	**Semester**	NONE

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. To prepare the students for careers and higher education. 2. To value teaching that will lead our students to participate in society. 3. To develop the students to have an awareness of theoretical perspectives in the teaching of physics. 4. To equip the students with manners, etiquettes and soft-skills. 5. To train the students for teaching English as a second language using the different modern technologies in language learning and teaching. 6. To promote students' creativity, self-assessment, and critical thinking skills. 7. To inculcate aesthetic sense and human values among the students
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Understanding the target language in terms of meaning and structure, in addition to pronunciation. 2. Developing basic language skills that enable the use of introductory-level vocabulary. 3. Developing understanding and the ability to use communicative language in daily life.
Indicative Contents المحتويات الارشادية	• Writing a simple, grammatically correct sentence that the student can use to describe people, express a desire or point of view, etc. • Understanding and comparing simple reading passages. • Daily multiple-choice quizzes.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Classroom education through theoretical and practical lectures. 2. Preparing scientific reports and research

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	8	All
	Assignments	1	10% (10)	3	all
	Activates	1	10% (10)	4	all
	Presentation	1	20% (10)	13	all
Summative assessment	Midterm Exam	2 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction Hello, Vocabulary, Everyday English
Week 2	Unit one:Questions words,What ...? Which ...? and so on...
Week 3	Questions words:Who ...? Why ...? How much. and so on…
Week 4	Unit Two:Tenses (Simple present tense),Positive and Negative Forms
Week 5	Tenses (Present Continuous),Positive and Negative Forms,have/have got
Week 6	First Exam: Reading and listening
Week 7	Unit Three:Past simple tense,Positive and Negative Forms
Week 8	Unit four:Quantity, Much and Many
Week 9	Articles :Definite and indefinite articles
Week 10	Unit Five:Verb patterns 1,Verbs followed by a to-infinitive
Week 11	Future intentions
Week 12	Unit Six:Comparative and superlative adjectives
Week 13	Tell me! What's it like?
Week 14	Review
Week 15	Preparatory Week Before the Final Exam
Week 16	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	New Headway Plus- student's book + workbook by John and Liz Soar	Yes
Recommended Texts	New Headway. Elementary. Student's book. Liz and John Soars	No
Websites	https://learnenglish.britishcouncil.org/english-grammar-reference/present-simple https://www.ef.com/wwen/english-resources/english-grammar/present-perfect	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Analytical Mechanics I			**Module Delivery**	
Module Type	Core Learning Activity			☒ **Theory** ☒**Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	PHY-213				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	Physics		**College**	Sciences	
Module Leader	Shaymaa Saadoon Hashim		**e-mail**	shhashim@uowasit.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate			**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-111	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. Make the student able to understand and know the basics of analytical mechanics 2. Make the student able to understand and know the practical applications of analytical mechanics 3. Make the student able to derive kinetic and potential motion equations 4. Provide a mathematically sophisticated reformulation of Newtonian mechanics and build up a good foundation in analytical mechanics. 5. To acquire capabilities to perform analysis of the classic mechanical phenomena. 6. Solve variety of problems analytically and systematically with confidence
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1- Enabling students to obtain knowledge and understanding of the topics of vector analysis and kinematics. 2- Enabling students to obtain knowledge and understanding of applications of analytical mechanics 3- Enabling students to obtain knowledge and understanding of the use of various physical laws in solving problems 4- Knowledge on constraints, generalized coordinates, velocities and accelerations. 5- Knowledge on calculus of variations and the concept of virtual displacement.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Introduction, Overview, Vectors, Derivation, [14 hrs] Position vector of a Particle, Velocity Vector, Acceleration Vector [14 hrs] Revision problem classes [3hrs] Part B – application Newton's laws of motion, Newton's First Law. Inertial Reference Systems Mass and Force. Newton's Second and Third Laws [13 hrs] Linear Momentum, Motion of a Particle, Rectilinear Motion. The Force as a Function of Position Only. The concepts of Kinetic and Potential Energy. [13 hrs]

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, using concepts in math and mechanics vocabulary, meaningful and frequent homework to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3, 4 5,6,7, and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	2	20% (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, Overview, Vectors
Week 2	Position vector of a Particle, Velocity Vector, Acceleration Vector.
Week 3	Derivatives of Products of Vectors, Tangential and Normal Components of Acceleration
Week 4	Velocity and Acceleration in Plane polar coordinates
Week 5	Velocity and Acceleration in Cylindrical and Spherical Coordinates
Week 6	Newton's laws of motion, Newton's First Law. Inertial Reference Systems
Week 7	Midterm Exam

Week 8	Mass and Force. Newton's Second and Third Laws
Week 9	Linear Momentum, Motion of a Particle, Rectilinear Motion.
Week 10	The Force as a Function of Position Only. The concepts of Kinetic and Potential Energy.
Week 11	The Force as a Function of Velocity Only, The Force as a Function Time Only
Week 12	Vertical Motion in a resisting Medium Terminal Velocity
Week 13	The Work Principle, Conservation Force and Force Fields, Potential Energy Function.
Week 14	Condition for the Existence of a Potential Function. The Del Operator.
Week 15	Motion of Charged Particles in Electric and Magnetic Fields.
Week 16	**Preparatory Week Before the Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Analytical Mechanics / by Grant R. Fowles (7th edition)	Yes
Recommended Texts		
Websites	All Websites explain Analytical mechanics	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Heat and Thermodynamic**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-212**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	Physics		**College**	Sciences	
Module Leader	Ahmed Khudhair Abbas Mehdi		**e-mail**	aalzubaidi@uowasit.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	1/6/2025		**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	Lab. of Heat and Thermodynamic	**Semester**	3

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. This course deals with the basic concepts and definitions related to heat and thermodynamics. 2. To describe types of thermodynamic variables. 3. To study different thermodynamic processes 4. To distinguish different thermodynamic laws. 5. To solve thermodynamic problems related to ideal and real gases. 6. To application chain rule thermodynamically. 7. To convert among different temperature scales.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Recognize different definitions related to heat and thermodynamics. 2. Recognize types of thermodynamic coordinates. 3. Discuss different thermodynamic processes (isothermal, isometric, isobaric, and adiabatic processes) 4. Summarize what is meant by zeroth, and first law of thermodynamics. 5. understand triple point of water 6. knowing and understanding the kinetic theory of gases 7. Understanding the different ways of achieving work. 8. understanding the laws related to kinetic theory of gases (Boyl's law, Charles's law, Avogadro's law, Joule's law) 9. Recognize the difference between heat and temperature. 10. to understand the different roles of thermometers.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Introduction to thermal physics , Historical review , Zeroth law of thermodynamics [15 hrs] Homogeneous and heterogeneous systems and implicit and non-implicit quantities, Quasi-steady processes and reversible processes, The difference between heat and temperature and different temperature conversions [15 hrs] Measuring temperature and types of thermometers, Volume expansivity coefficient isothermal compressibility coefficients, • Isothermal, isometric and isobaric process for an ideal gas [15 hrs] Revision problem classes [3hrs]Part B – application Work and heat in thermodynamic processes , The first law of thermodynamics , Ca of isolated, closed, and adiabatic systems according to the first law[15 hrs] Heat capacity and specific heat capacity, Some consequences of the first law of thermodynamics. [15 hrs]

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 discussions and solving exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.7
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	5% (5)	5, 10	LO #1, 3, 4 and 7
	Assignments	2	20% (20)	4, 12	LO # 3, 4, 7 and 8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	5% (5)	13	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to thermal physics and definitions
Week 2	Related the thermodynamic coordinates to mathematical laws
Week 3	Homogeneous and heterogeneous systems and implicit and non-implicit quantities
Week 4	Zeroth law of thermodynamics and thermometers

Week 5	Quasi-steady processes and reversible processes
Week 6	The difference between heat and temperature and different temperature conversions
Week 7	Kinetic theory of gases with different laws of gases
Week 8	Equation of state for an ideal and real gases
Week 9	Volume expansivity coefficient and isothermal compressibility coefficient
Week 10	Isothermal, isometric and isobaric processes for an ideal gas
Week 11	Work and heat in thermodynamic processes
Week 12	The first law of thermodynamics
Week 13	Heat capacity and specific heat capacity
Week 14	Adiabatic process for an ideal and non ideal gases
Week 15	Some consequences of the first law of thermodynamics
Week 16	**Preparatory Week Before The Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab1 : Experiment to achieve Newton's law of cooling
Week 2	Lab2 : Experiment to fulfill Boyle's law
Week 3	Lab3 : Experiment to calculate the heat capacity of oil using the mixing method
Week 4	Lab4: Experiment to calculate the coefficient of longitudinal expansion of metals
Week 5	Lab5 : An experiment that determines the melting point of wax from its cooling curve
Week 6	Lab6 : Experiment to calculate the apparent coefficient of expansion of liquids
Week 7	Lab7 : Experiment with resistance gradients and use them to measure temperatures
Week 8	Lab8 : Thermal machine work
Week 9	Lab9 : Experiment with the thermoelectric coupler gradient and its use as a thermometer
Week 10	Lab 10 : Calculate the coefficient of friction

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Thermodynamics, kinetic theory and statistical thermodynamics(sears and Salinger)	Yes
Recommended Texts	Heat and Thermodynamics (Mark W. Zemansky)	No
Websites	hyperphysics.phy-astr.gsu.edu	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Mathematics IV**			**Module Delivery**	
Module Type	**Basic learning activity**			☒ **Theory** ☒**Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-225**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**UGII**	**Semester of Delivery**		4
Administering Department		Physics	**College**	Science	
Module Leader	Najlaa Jerjack Abdullah Karmsh		**e-mail**	njerjack@uowasit.edu.iq	
Module Leader's Acad. Title		Asst. Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		15/1/2026	**Version Number**		1.0

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-225	**Semester**	3
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. This course deals with the basic concepts and definitions related to matrices and its applications in physics. 2. Studying mathematical material related to the study of physics by focusing on important concepts and functions Used in physics. 3. Study differential equations and its types.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Recognize different definitions related to matrices. 2. Recognize type of matrices. 3.Discuss the operations on matrices 4. .Discuss the applications of determinants 5.understand the differential equations 6.know types of differential equations
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Introduction to matrices, Properties of matrices, Types of matrices, Operations on matrices, solving a group from exercises [14 hrs.] Applications of determinants, Differential equations, Formation of Differential equations, Ordinary differential equation, Homogeneous differential equations, Exact differential equations, solving a group from exercises [14 hrs.] Revision problem classes [3hrs] Part B – application Applications of determinants, Differential equations and its applications, [13 hrs.] Application of some differential equations, Applications of matrices in physics [13 hrs.]

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, using concepts in math vocabulary, meaningful and frequent homework to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	10% (10)	Continuous	All
	Report	2	0% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	20% (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	Matrices
Week 2	Properties of matrices
Week 3	Types of matrices
Week 4	Operations on matrices
Week 5	Applications of determinants
Week 6	solving a group from exercises
Week 7	Midterm Exam

Week 8	Differential equations
Week 9	Formation of Differential equations
Week 10	Types of differential equations
Week 11	Ordinary differential equation
Week 12	Linear differential equation
Week 13	Homogeneous differential equations,Exact differential equations
Week 14	Partial differential equations
Week 15	solving a group from exercises
Week 16	**Preparatory Week Before The Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. جبر المصفوفات –للمرحلة الجامعية 2. نظريات ومسائل في المصفوفات	Yes
Recommended Texts	Ordinary and partial differential equations	No
Websites	http://www.stat.uchicago.edu/~lekheng/courses/309/books/Bernstein.pdf	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Modern Physics II**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☒**Lecture** ☒**Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-221**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGII**	**Semester of Delivery**		4
Administering Department		Physics	**College**	Sciences	
Module Leader	Muneer Hlail Jadua'a ALzubaidy		**e-mail**	malzubaidy@uowasit.edu.iq	
Module Leader's Acad. Title		Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	malzubaidy@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		1/2/2026	**Version Number**		1.0

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-211	**Semester**	**3**
Co-requisites module	Lab.of Modern Physics II	**Semester**	**4**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. Provide simple and clear explanations of the main physical concepts and theories of the twentieth century. 2. To illustrate these concepts and theories through a wide range of current applications and examples and to activate the text with brief drawings of the historical development of the concept of the duality of wave and particle properties of light. 3. To make the student understand how thinking has evolved around the need to find scientific explanations for some physical phenomena that did not have a clear scientific explanation. 4. To make the student understand the development of the concept of wave and wave function and the modern concept in physics. 5. To develop an understanding of quantum mechanics and the Schrödinger equation and its applications in many physical phenomena. 6. To enhance critical thinking, analytical reasoning and problem solving skills. 7. Give an understanding of nuclear radiation and nuclear reactions.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1 . Review the concept of waves and types of waves 2. Explain the necessity of considering light as particles 3. Review the concept of the duality of particle and wave properties of electromagnetic waves and provide an understanding of the practical applications of this concept. 4. Give an idea of the development of the concept presented by the scientist de Broglie for the wave nature of particles and the applications of this principle. 5. Review the nature of the wave function and how we can adopt it to understand the behavior of particles in quantum systems. 6. Provide an easy introduction to the basics of quantum mechanics and the Schroedinger equation and review modern applications of this equation. 7. Provide the necessary concepts and knowledge of nuclear physics and the basic concepts that the student must know at this stage of study.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals waves and types of waves, the duality of particle and wave properties, for the wave nature of particles , The principle of duality of de Broglie [14 Hours] Review Problem Chapters [3 Hours] Part B – Application quantum mechanics Schroedinger equation [14 Hours] Atomic Components, Quantum Values and Review Problems [14 Hours] nuclear physics and the basic concepts [14 Hours] the radiation emitted by materials and to gain knowledge to study it[14 Hours]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in presenting this module is to encourage students' participation in explaining the daily lecture, clarifying modern physics concepts by comparing these concepts with what is around us in nature, and using meaningful and repetitive homework to encourage students to participate in the exercises and understand exercises and how to apply them, while at the same time refining and expanding students' scientific thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.7
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)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	2	10% (10)	Continuous	All
	Report	2	20% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Wave properties
Week 2	Pauli's exclusion principle
Week 3	Photoelectric effect
Week 4	Compton phenomenon
Week 5	The de Broglie principle
Week 6	The principle of duality of de Broglie
Week 7	Midterm Exam
Week 8	Equation of motion of a wave packet
Week 9	Introduction to Quantum mechanics
Week 10	Schroedenker equation , Time-dependent Schroedenker equation
Week 11	The wave function and its physical interpretation
Week 12	Wave function
Week 13	Probability density
Week 14	Applications of the Schroedenker equation and Schroedenker equation for the hydrogen atom
Week 15	Nuclear analysis , Radioactivity and Types of nuclear reactions
Week 16	**Preparatory Week Before The Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Acquaint students with the knowledge of laboratory** Modern Physics II **and devices used in the laboratory, and how to write reports after conducting experiments**
Week 2	**Bragg's Law and X-ray Spectrum**
Week 3	**Ionization Chamber Properties and Alpha Particle Range in Air**
Week 4	**Gamma Ray Backscattering in Air**
Week 5	**Elementary Charge and Millikan Experiment**

Week 6	**Franck–Hertz Experiment**
Week 7	**First Excitation Potential and Ionization Energy of Helium (Franck–Hertz Tube)**
Week 8	**Work Function and Planck's Constant using Photoelectric Cell**
Week 9	**Electron Diffraction Experiment**
Week 10	**Review of Previous Experiments**
Week 11	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	مفاهيم في الفيزياء الحديثة ، تاليف ارثر بايزر – ترجمة : د.عبد المنعم مشكور د.شاكر جابر شاكر	Yes
Recommended Texts	**Modern Physics , Uttarakhand Open University, Haldwani, Nainital- 263139**	No
Websites	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.uou.ac.in/sites/default/files/slm/BSCPH-302.pdf	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Analytical Mechanics II**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-223**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**UGII**		**Semester of Delivery**	4	
Administering Department	Physics		**College**	Sciences	
Module Leader	Shaymaa Saadoon Hashim		**e-mail**	shhashim@uowasit.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	N.A.		**e-mail**	N.A.	
Peer Reviewer Name	N.A.		**e-mail**	N.A.	
Scientific Committee ApprovalDate	1/2/2026		**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-213	**Semester**	2
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. Make the student able to understand and know the basics of analytical mechanics 2. Make the student able to understand and know the practical applications of analytical mechanics 3. Make the student able to derive kinetic and potential motion equations 4. Provide a mathematically sophisticated reformulation of Newtonian mechanics and build up a good foundation in analytical mechanics. 5. To acquire capabilities to perform analysis of the classic mechanical phenomena. 6. Solve variety of problems analytically and systematically with confidence
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1- Enabling students to obtain knowledge and understanding of the topics of vector analysis and kinematics. 2- Enabling students to obtain knowledge and understanding of applications of analytical mechanics 3- Enabling students to obtain knowledge and understanding of the use of various physical laws in solving problems 4- Knowledge on constraints, generalized coordinates, velocities and accelerations. 5- Knowledge on calculus of variations and the concept of virtual displacement.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Oscillations [14 hrs] Damped Harmonic Motion. [14 hrs] Revision problem classes [3hrs] Part B – application Mechanics of a Rigid Body [13 hrs] Lagrange's Equations.[13 hrs

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, using concepts in math and mechanics vocabulary, meaningful and frequent homework to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	8, 12	All
	Assignments	2	10% (10)	2, 12	All
	H. W	2	10% (10)	3,8	All
	Report	2	10% (10)	13	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Oscillations, Linear Restoring Force.
Week 2	Energy Considerations in Harmonic Motion.
Week 3	Damped Harmonic Motion.
Week 4	Energy Considerations in Damped Harmonic Motion.
Week 5	Mechanics of a Rigid Body, Motion in a plain.
Week 6	Center of Mass of a Rigid Body, Static Equilibrium of a Rigid Body.
Week 7	Midterm Exam
Week 8	Angular Momentum of a rigid Body. Momentum of Inertia, Principal Axes of a rigid Body.

Week 9	Collision of Rigid Bodies
Week 10	Rotational Kinetic Energy, Moment of Inertia of a rigid Body about an Arbitrary Axis.
Week 11	Free Rotation of a Rigid Body Under no Forces. Geometric Description of the Motion
Week 12	Free Rotation of a Rigid Body with an Axis of Symmetry. Analytical Treatment
Week 13	Generalized Coordinates, Generalized Forces, Lagrange's Equations.
Week 14	Lagrange's Equations for Impulsive Forces, Hamilton's Variational Principle.
Week 15	Potential Energy and Equilibrium. Expansion of the Potential – energy Function in a power Series.
Week 16	**Preparatory Week Before the Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Analytical Mechanics / by Grant R. Fowles (7th edition)	Yes
Recommended Texts		
Websites	All Websites explain Analytical mechanics	

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.

MODULE DESCRIPTION
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Thermodynamics and Statistical**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☒**Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-222**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	UGII		**Semester of Delivery**	4	
Administering Department	Physics		**College**	Sciences	
Module Leader	Ahmed Khudhair Abbas Mehdi		**e-mail**	aalzubaidi@uowasit.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	1/2/2026		**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-212	**Semester**	3
Co-requisites module	Lab.of Thermodynamics and Statistical	**Semester**	4

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	4. This course deals with concepts of the second law of thermodynamics. 5. To describe concept of Entropy of a system 6. To study different thermodynamic cycles and engines 7. To distinguish between internal and external combustion engines.. 8. To solve thermodynamic problems related to the consequences of second law of thermodynamics. 9. To application Maxwell's equations thermodynamically. 10. To study different statistical laws and their applications.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Recognize different definitions related to the second law of thermodynamics/. 2. Recognize types of different statements of second law of thermodynamic: engines and refrigerators.. 3. Discuss different types of cycles 4. Summarize what is meant by internal and external combustion engines. 5. combining first and second law of thermodynamics 6. knowing and understanding the free functions and thermodynamic potentials. 7. Understanding the different ways of connection Maxwell/s equations with Thermodynamics. 8. understanding the laws related to Statistical thermodynamics (Maxwell-Boltzmann law, Fermi-Dirac law, Bose-Einstein law) 9. Recognize the applications of all laws of statistical thermodynamics..
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Introduction to the second law of thermodynamics , Kelvin- Blanck statement, Clauisus statement , concept of entropy, laws of entropy, heat engine, efficiency of heat engine, types of cycles ,Carnot cycle and its efficiency , Otto cycle and its efficiency, Stirling cycle and its efficiency, Diesel engine and its efficiency, combined first and second law of thermodynamics [15 hrs] Definition of free functions in thermodynamics, Gibbs function, Helmholtz function, definition of thermodynamic potentials, related different free functions (Gibbs and Helmholtz) with Enthalpy and internal energy in thermodynamical systems, Gibbs and Helmholtz equations, Maxwell's equations, relating partition function with free functions and enthalpy equations, calculation of entropy, pressure, enthalpy , Gibbs function and Helmholtz function for different partition functions. [15 hrs] Revision problem classes[3hrs] Part B – application Statistical thermodynamics, Maxwell-Boltzmann statistics, applications of Maxwell Boltzmann statistics, Fermi-Dirac statistics, applications of Fermi-Dirac statistics, Bo Einstein statistics, applications of Bose-Einstein statistics. [15 hrs]

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 discussions and solving exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.3
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.7
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	5% (5)	5, 10	LO #1, 3, 4 and 7
	Assignments	2	20% (20)	4, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	5% (5)	13	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to the second law of thermodynamics , Kelvin- Blanck statement, Clauisus statement , concept of entropy, laws of entropy
Week 2	heat engine, efficiency of heat engine, types of engines, types of cycles

Week 3	Carnot cycle and its efficiency , Otto cycle and its efficiency, Stirling cycle and its efficiency, Diesel engine and its efficiency
Week 4	combined first and second law of thermodynamics [
Week 5	Definition of free functions in thermodynamics, Gibbs function, Helmholtz function
Week 6	definition of thermodynamic potentials, related different free functions (Gibbs and Helmholtz) with Enthalpy and internal energy in thermodynamical systems
Week 7	Gibbs and Helmholtz equations, Maxwell's equations, relating partition function with free functions and enthalpy equations
Week 8	calculation of entropy, pressure, enthalpy , Gibbs function and Helmholtz function for different partition functions
Week 9	Statistical thermodynamics, definition of statistical mechanic, definition of cell, differentiation between macrostates and microstates in statistical thermodynamics
Week 10	Phase space and 6 dimensional space in statistical thermodynamics, density of particles in phase sp Definition of thermodynamic probability relation between thermodynamic probability with en states in statistical thermodynamics.,
Week 11	Types of statistical thermodynamics, definition of Maxwell-Boltzmann statistics, definition of Fermi-Dirac statistics, definition of Bose-Einstein statistics
Week 12	applications of Maxwell-Boltzmann statistics
Week 13	applications of Fermi-Dirac statistics
Week 14	applications of Bose-Einstein statistics
Week 15	Some consequences related to different methods of statistical thermodynamics.
Week 16	**Preparatory Week Before The Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab1 : Experiment of Finding the specific heat capacity of copper by converting mechanical energy into heat (Calender's device)
Week 2	Lab2 : Experiment to fulfill Joule equivalent
Week 3	Lab3 : Experiment of Finding the viscosity coefficient of water using a capillary tube
Week 4	Lab4: Experiment of Investigating Stefan's law
Week 5	Lab5 : An experiment of Calculating the specific heat capacity of a piece of metal
Week 6	Lab6 : Experiment to Determine the thermal conductivity coefficient of a poor conductor of heat using the (Lee disk) method
Week 7	Lab7 : Experiment of Determining the latent heat of fusion of ice
Week 8	Lab8 : Calculating the mixing temperature of water

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Thermodynamics, kinetic theory and statistical thermodynamics(sears and Salinger)	Yes
Recommended Texts	Heat and Thermodynamics (Mark W. Zemansky)	No
Websites	hyperphysics.phy-astr.gsu.edu	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Crime of the Baath regime in Iraq**			**Module Delivery**	
Module Type	**Suport learning activities**			☐ **Theory** ☒ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**WUO5**				
ECTS Credits	**2**				
SWL (hr./seem)	**50**				
Module Level		**UGII**	**Semester of Delivery**		4
Administering Department		Physics	**College**	Sciences	
Module Leader	Hassnein Farman Aboud Lafta		**e-mail**	h.farman@uowasit.edu.iq	
Module Leader's Acad. Title		Lecture	**Module Leader's Qualification**		Ph.D
Module Tutor	Name (if available)		**e-mail**		
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/02/2026	**Version Number**		1.0

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	None
Co-requisites module	Noneد	**Semester**	None

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	**1- تعليم الطلبة وزيادة وعيهم من خلال الاطلاع على جميع أنواع الجرائم المرتكبة من قبل حزب النظام البائد والإلمام بكافة مواضيعه من حيث التعرف على مفهوم الجرائم وأقسامها** **2- التعرف على ابرز الانتهاكات النفسية والجسمية التي تعرض لها أبناء الشعب العراقي**

	3- –التعرف على اثأر هذه الجرائم النفسية والاجتماعية وإكساب الطالب معرفة ومهارة خاصة بالدفاع عن هذه حقوقه ومطالبتهم بجميع حقوقهم المدنية والسياسية 4- إكساب الطالب معرفة عامة عن أساسيات النظام السابق وجميع الجرائم التي ارتكبها بحق أبناء الشعب العراقي من مختلف المكونات والأطياف وتأسيس جيل واعي رافض لكل أنواع الظلم والاستبداد والتسلط ومدى مطالبته بجميع حقوقه.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- القدرة على جمع المعلومات وتوحيدها 2- استقبال المعلومات بصورة صحيحة 3- يمكن للطا لب ان يميز بين مفهوم الجريمة لغة ومفهوم الجريمة اصطلاحا ومفهومها في جميع العلوم الإنسانية الأخرى 4- استقبال الطالب وتقبله للماده 5- يمكن للطالب ان يميز بين أنواع جرائم حزب البعث
	المحتوى الإرشادي يشمل ما يلي: 1- طرق التعليم والتعلم. 2- المحاضرات 3- الشرح والمناقشة وحل المسائل 4- تكليف مهام (كتابة التقارير و واجبات بيتية) 5- الامتحانات اليومية والشهرية

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	**استراتيجيات وطرائق التعليم والتعلم المعتمدة في تنفيذ البرنامج بشكل عام.** **المحاضرات التفاعلية بين الأستاذ والطلاب وتبادل الأفكار والأسئلة والمناقشات الجماعية حول جميع مواضيع جرائم حزب البعث.** **الاختبارات اليومية والشهرية.** **التقارير البحثية من اجل رفع قدرة الطلبة في فهم واستيعاب جرائم حزب البعث** التقييم الشخصي لكل طالب من خلال مدى فهمه واستيعابه لهذه المادة وتحديد نقاط القوة والضعف.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
Structured SWL (h/seem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/seem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.13
Total SWL (h/seem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

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.				
	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 الأسبوعي النظري

	Material Covered
الأسبوع 1	مقدمة مفهوم الجرائم لغة واصطلاحاً
الأسبوع 2	أقسام الجرائم
الأسبوع 3	جرائم حزب البعث وفق قانون المحكمة الجنائية العليا
الأسبوع 4	التعرف على الجرائم الدولية
الأسبوع 5	التعرف على القرارات الصادرة من المحكمة الجنائية العليا
الأسبوع 6	التعرف على الجرائم النفسية وابرز أثارها
الأسبوع 7	التعرف على اليات الجرائم النفسية
الأسبوع 8	التعرف على الجرائم الاجتماعية
الأسبوع 9	موقف حزب البعث من الدين
الأسبوع 10	عسكرة المجتمع التعرف على ابرز انتهاكات حقوق الأنسان
الأسبوع 11	التعرف على الجرائم البيئية
الأسبوع 12	التعرف على المقابر الجماعية
الأسبوع 13	التعرف على التلوث الحربي و تجريف البساتين
الأسبوع 14	الأسبوع التحضيري قبل الامتحان النهائي.

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	منهج جرائم حزب البعث,	نعم
Recommended Texts	أرشيف مؤسسة السجناء السياسيين	
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

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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Arabic Language II**			**Module Delivery**	
Module Type	**Suport or related learning activity**			☐ ☒ **Theory** ☐ ☒ **Lecture** ☐ **Lab** ☐ ☐ **Tutorial** ☐ ☐ **Practical** ☐ ☐ **Seminar**	
Module Code	**WU21**				
ECTS Credits	**2**				
SWL (hr/sem)	**50**				
Module Level	UGII		**Semester of Delivery**	2	
Administering Department	Physics		**College**	sciences	
Module Leader	**Ahmed Abdulhamid Rasan**		**e-mail**	ahmedabd@uowasit.edu.iq	
Module Leader's Acad. Title	Lectuer		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	20/01/2026		**Version Number**	1.0	

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	
6-تعلم 6	1- أن يفهم الطالب أهمية اللغة العربية 2- التعرف على القواعد الرئيسية في اللغة العربية 3- التعرف على اهم الاخطاء الشائعة في الكتابة 4- التعرف على مختلف النصوص الادبية والشعرية 5- تعريف الطلبة على كتابة الاعداد بصورة صحيحة 6 – تعليم الطلبة اسس البلاغة 7- تعلم الطلبة على علامات التنقيط
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-- المعرفة والفهم 2- -التعرف على اللغة العربي 3- التعرف على مراحل التطور الادبي 4- المقارنة بين الشعر العامودي و بين الشعر الحر 5 -التعرف على مناهج البحث العلمي
Indicative Contents المحتويات الإرشادية	رفع مستوى الطلبة من خلال التوجيه والارشاد وتحليل القصائد الشعرية والتعرف على اهم الاخطاء اللغوية وفهم البلاغة العربية بصورة ادق واوسع

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	المهارات العامة والتأهيلية المنقولة (المهارات الأخرى المتعلقة بقابلية التوظيف والتطور الشخصي). د1-توفير فرص التعلم المستمر للطلبة وتحفيزهم عليها د2- التعلم الذاتي المنظم د3- التواصل الاجتماعي د4- الإدارة الذاتية

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**33**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	**17**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**50**		

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	All
	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	**اسم التفضيل**
Week 2	**شرح وتحليل قصيدة الشاعر المتنبي الخيل والليل والبيداء تعرفتي**
Week 3	**المبتدأ والخبر**
Week 4	**الرواية الشعرية**
Week 5	**اختبار الشهر الاول**
Week 6	**الحروف الشمسية والقمرية**
Week 7	**قصيدة بدر شاكر السياب مطر مطر**
Week 8	**الضمائر في اللغة العربية**
Week 9	**حياة الشاعرة نازك الملائكة وتحليل قصيدة الشهيد**
Week 10	**الثاني**
Week 11	**اسلوب الاستفهام في اللغة العربية**
Week 12	**قصيدة نازك الملائكة النهر العاشق**
Week 13	**شرح وتحليل قصيدة الفرزدق في مدح الامام السجاد عليه السلام**
Week 14	**الجملة الفعلية في اللغة العربية**
Week 15	**اختبار الشهر الثالث**
Week 16	**مراجعة شاملة**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	الكتاب المنهجي المقرر من الوزارة	Yes
Recommended Texts		No
Websites	محاضرات خاصة بالموضوع / كتب وبحوث وتقارير	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Digital Electronics**			**Module Delivery**	
Module Type	**Core learning activity**			☒ Theory ☐ Lecture ☒ Lab ☒Tutorial ☐ Practical ☐ Seminar	
Module Code	**PHY-224**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**2**		**Semester of Delivery**	**4**	
Administering Department	**Physics**		**College**	Sciences	
Module Leader	**Ahmed Abdul Mahdi Abdul Kareem**		**e-mail**	aalawsiA@uowasit.edu.iq	
Module Leader's Acad. Title	**LECTURE**		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	**01/02/2026**		**Version Number**	**1.0**	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	**Lab. of Digital Electronics**	**Semester**	**4**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	Digital Electronics is considered a fundamental course for students in the scientific stream due to its crucial role in transitioning their understanding from analog concepts to the world of digital systems. This transition is especially important in the present era, where digital technology is integrated into nearly every electronic device, owing to its significant advantages over analog electronics in terms of accuracy, reliability, and efficiency. The course also aims to provide students with a solid foundation in the principles of Boolean algebra, an understanding of basic and advanced logic gates, and the skills required for the analysis and design of digital logic circuits
Module Learning Outcomes مخرجات التعلم المادة الدراسية	• Understanding number systems and methods of conversion between them. • Performing arithmetic operations in the binary number system. • Analyzing digital circuits and deriving their Boolean expressions using Karnaugh Maps (K-Map). • Designing digital circuits based on truth tables and implementing them as logic circuits. • Simplifying Boolean expressions using the fundamental laws of Boolean algebra. • Utilizing flip-flops to design digital circuits for generating different output frequencies from an input signal. • Designing and implementing binary digital counters. • Designing various types of registers based on their inputs and outputs.
Indicative Contents المحتويات الارشادية	**Teaching Methods and Assessment:** • Printed lecture notes. • Detailed explanations on the board. • Use of educational videos. • Recorded video lectures. • Daily assignments. • Scientific reports. • Short quizzes. • Daily class participation and activities. • Midterm examinations.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	• Activating teaching methods that continuously develop the learner's personality and reduce reliance on the instructor. • Implementing teaching approaches based on e-learning, utilizing data show (projectors) and smart boards. • Promoting meaningful, concept-based and realistic learning. • Using common teaching methods such as lecturing, live questioning, problem-solving, and class discussion.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.27**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	71	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**4.73**
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)	4,9	All
	Assignments&H.W	**2**	10% (10)	3,10	All
	Projects / Lab.	**1**	10% (10)	Continuous	All
	Report	**1**	10% (10)	12	All
Summative assessment	**Midterm Exam**	**2 hr**	10% (10)	8	All
	Final Exam	**3hr**	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	**Introduction to digital electronic and numbering systems**
Week 2	**The conversion between the numbering systems**
Week 3	**Decision making elements "NOT, AND, OR Gates"**
Week 4	**Logic Families"NAND, NOR, XOR, XNOR Gates"**
Week 5	**How to derive Boolean expression from Truth Table**
Week 6	**Simplify Boolean expressions by DeMorgan's theorems**
Week 7	**First exam**

Week 8	**Applied Mathematic operations on signed and unsigned binary numbers**
Week 9	**Design Half and Full Adder, How to find Boolean expression for any digital system using K-MAP**
Week 10	**Design digital decoder and encoder**
Week 11	**Design digital multiplexer and demultiplexer**
Week 12	**Types of digital Flip Flop**
Week 13	**Applications of Flip Flop (Frequency division, counters)**
Week 14	**Applications of Flip Flop (Frequency division, counters)**
Week 15	**Types of digital shift registers**
Week 16	**Second exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	**Identifying the types of digital devises (Test board, Ics)**
Week 2	**Realizing the truth table for the primary logic gates (AND, OR, NOT)**
Week 3	**Realizing the truth table for the secondary logic gates (XOR, XNOR, NAND, NOR)**
Week 4	**Half and Full adder**
Week 5	**Realizing of De Morgan theorem**
Week 6	**First test**
Week 7	**Experiments of Decoder and Encoder**
Week 8	**Experiments of MUX and DEMUX**
Week 9	**Experiments of types of Flip Flop**
Week 10	**Experiments of counters**
Week 11	**Second test**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	الالكترونيك الرقمي	Yes
Recommended Texts	Digital Fundamentals (Floyd 10th edition)	No
Websites	https://bpcbirgunj.edu.np/wp-content/uploads/2019/10/DIGITAL_ELECTRONICS-by-Flyod.pdf	

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.

Third Stage

General Physics

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Laser Physics I**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-312**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIII**	**Semester of Delivery**		**5**
Administering Department		Physics	**College**	Sciences	
Module Leader	Ali Kamel Mohsin		**e-mail**	aalbedary@uowasit.edu.iq	

Module Leader's Acad. Title	Assist Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	
Peer Reviewer Name		**e-mail**	
Scientific Committee ApprovalDate	14/08/2025	**Version Number**	1.0

Relation with other Modules

العالقة مع المواد الدراسية الأخرى

Prerequisite module	**None**	**Semester**	
Co-requisites module	**Lab. of Laser Physics**	**Semester**	**5**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	By the end of this course, students will be able to: 5. Explain the fundamental principles of laser operation including stimulated emission, population inversion, and threshold conditions. 6. Apply optical physics concepts such as Gaussian beam propagation, resonator design, and optical gain to analyze laser systems. 7. Classify and compare different laser types (solid-state, gas, semiconductor, and dye) and evaluate their practical applications. 8. Analyze the dynamic behavior of lasers including transient processes, Q-switching, and mode-locking, and relate them to pulse generation techniques. 9. Evaluate advanced laser applications in industry, medicine, spectroscopy, and atomic physics, including nonlinear optics and ultrafast phenomena. 10. Demonstrate safe and effective use of lasers by applying beam quality control, frequency stabilization techniques, and adhering to international laser safety standards.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	Upon successful completion of the course, the student will be able to: 10. Describe the theoretical background of laser action using appropriate physics terminology and mathematical models. 11. Solve quantitative problems involving laser gain, threshold power, and beam divergence. 12. Design a basic optical resonator and calculate Gaussian beam parameters using the ABCD matrix method. 13. Select an appropriate laser type for a given application based on performance specifications. 14. Interpret temporal and spectral characteristics of pulsed lasers and relate them to Q-switching and mode-locking techniques. 15. Implement laboratory safety protocols in handling high-power lasers and sensitive optical equipment.
Indicative Contents المحتويات الارشادية	Chapter 1 – Introduction to Laser Physics (4 hours): Historical background, stimulated emission principles. : Laser system components, energy level schemes (two-, three-, four-level systems). Chapter 2 – Energy Inversion and Threshold Theory (4 hours) :Einstein coefficients (A and B), population inversion: Rate equations, threshold theory for laser action. Chapter 3 – Light Amplification and Optical Resonators (6 hours): Optical gain and amplification process: Resonator configurations (stable and unstable). ABCD matrix method, Gaussian beam propagation. Chapter 4 – Types of Lasers and Their Applications (4 hours): Solid-state and gas lasers: Semiconductor and dye lasers, applications. Chapter 5 – Transient Dynamics in Lasers (6 hours) 2 hours: Relaxation oscillations. 2 hours: Q-switching and cavity dumping. 2 hours: Mode-locking techniques and ultrashort pulse generation. Chapter 6 – Advanced Applications and Laser Safety (4 hours) 2 hours: Laser amplifiers, frequency doubling, ultrafast lasers, laser cooling. 2 hours: Beam quality, frequency stabilization, safety protocols. Final Review (2 hours) 2 hours: Comprehensive revision, problem-solving, exam preparation.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The learning strategy for the Laser Physics course combines interactive lectures supported by multimedia with discussions to enhance engagement, problem-based learning to connect theory with practical experimentation, and laboratory sessions to conduct hands-on experiments on laser systems while emphasizing safety procedures. It also includes computer simulations using specialized software to design resonators and analyze optical beams, short projects such as research or case studies on laser applications in scientific and industrial fields, and continuous assessment through quizzes, assignments, and a final review to consolidate knowledge before the exam .

Student Workload (SWL)
الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** ال 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**	**4**	**5% (10)**	**2, 12**	**LO #1, 2,3 , 4 5,6,7,and 8**
	Assignments&H.W	**2**	**5% (10)**	**2, 12**	**LO # 9, 10, 11 and 12**
	Projects / Lab.	**2**	**10% (10)**	**Continuous**	**All**
	Report	**2**	**10% (10)**	**13**	**LO # 5, 8 and 10**
Summative Assessment	**Midterm Exam**	**2 hr**	**20% (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 Laser Physics: Definition, history, and development. Concept of stimulated emission, absorption, and spontaneous emission.
Week 2	Components of a laser system (active medium, pumping source, optical resonator), Energy level schemes: two-level, three-level, and four-level system
Week 3	Einstein coefficients (A and B) and their physical meaning, Population inversion and its significance.
Week 4	Rate equations for steady-state operation, Threshold theory for laser action.
Week 5	Optical amplification and the gain process in the laser medium, Signal gain and optical losses.
Week 6	Optical resonators: stable and unstable configurations, Resonator design based on optical criteria.
Week 7	ABCD matrix method for optical system analysis, Gaussian beam characteristics and propagation.
Week 8	Midterm examination covering Weeks 1–7 topics.
Week 9	Solid-state lasers: Ruby and Nd:YAG lasers, Operating characteristics and applications.
Week 10	Gas lasers: He–Ne and CO_2 lasers, Semiconductor and dye lasers.
Week 11	Transient dynamics: relaxation oscillations, Q-switching technique for short pulse generation.
Week 12	Cavity dumping technique, Mode-locking technique for ultrashort pulse generation.
Week 13	Laser amplifiers and their mechanisms, Second harmonic generation (SHG).
Week 14	Ultrafast lasers and their applications, Laser cooling principles.
Week 15	Beam quality, frequency stabilization, and laser safety standards.
Week 16	**Preparatory Week Before The Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	**Acquaint students with the knowledge of laboratory Laser and devices used in the laboratory, and how to write reports after conducting experiments**
Week 2	**Study the beam intensity of Gaussian curve**
Week 3	**Study the beam waist of Gaussian curve**
Week 4	**Study the polarization of laser light through one polarizing filter**
Week 5	**Study the polarization of laser light through two polarizing filters**
Week 6	**Exam**
Week 7	**Measuring the wavelength of laser light**

Week 8	**Study the Laser beam divergence angle**
Week 9	**Study the Critical angle**
Week 10	**Determine the width of variable slot by laser beam**
Week 11	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Laser Physics	Yes
Recommended Texts	Fundamental and Applied Laser Physics online at https://short-link.me/1b6gr	No
Websites	https://www.rp-photonics.com/encyclopedia.html	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Laser Physics II**			**Module Delivery**	
Module Type	**Core learning activity**			☒ Theory ☐ Lecture ☒Lab ☒ Tutorial ☐Practical ☐Seminar	
Module Code	**PHY-322**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**UGIII**		**Semester of Delivery**		**6**
Administering Department	**Physics**		**College**	**Sciences**	
Module Leader	**ALI KAMEL MOHSIN**		**e-mail**	**aalbadery@uowasit.edu.iq**	
Module Leader's Acad. Title	**Assist prof.**		**Module Leader's Qualification**		**PhD**
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	**1/2/2026**		**Version Number**		**1.0**

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	**PHY-312**	**Semester**	**5**
Co-requisites module	**Lab. of Laser Physics**	**Semester**	**6**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1- To provide students with a profound understanding of the temporal control of laser emission, focusing on the transition from Continuous Wave (CW) to pulsed modes. 2- To enable students to mathematically model and physically describe the storage and rapid release of energy within a laser resonator. 3- To compare and contrast active and passive modulation methods (Mechanical, Electro-Optic, and Acousto-Optic) for different laser types. 4- To introduce the principles of **Mode-Locking** and the generation of picosecond and femtosecond pulses for high-precision applications. 5- To understand how high-intensity laser beams interact with matter to produce new frequencies (Harmonic Generation) and self-focusing effects. 6- To familiarize students with the construction and operation of advanced systems like Fiber Lasers, Ti:Sapphire, and Quantum Cascade Lasers (QCL). 7- To bridge the gap between classroom physics and real-world applications in medical surgery, micro-machining, and LIDAR technology.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	By the end of this course, the student will be able to: 1. **Calculate** the peak power and pulse duration for a given Q-switched laser system. 2. **Select** the appropriate saturable absorber or Pockels cell based on the laser's wavelength and gain. 3. **Explain** the role of phase-matching in non-linear optical crystals. 4. **Analyze** the stability of complex laser resonators using matrix optics (Ray Transfer Matrices).
Indicative Contents المحتويات الارشادية	***Lectures:** Transitioning from mathematical derivations to physical interpretations. ***Problem-Solving Sessions:** Focused on rate equations and beam propagation calculations. ***PRACTICING :** Using laser instroments in lab. OptiSystem to visualize pulse formation.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	**1. Flipped Classroom Model** • **Method:** Students are provided with digital resources (pre-recorded lectures on Q-switching or research papers on Pockels cells) before the session. • **In-Class Activity:** The lecture time is transformed into an interactive workshop for derivation of rate equations and discussing the limitations of each technique. **2. Research-Led Teaching (RLT)** • **Method:** Integrating recent breakthroughs in laser technology (e.g., 2023/2024 papers on Attosecond pulses or Fiber lasers). • **Activity:** Students analyze a "Case Study" from a high-impact journal (like *Nature Photonics*) to understand how **Passive Mode-Locking** is applied in current high-speed communications. **3. Problem-Based Learning (PBL)** • **Method:** Presenting a real-world engineering challenge. • **Example:** "Design a laser system capable of eye surgery (LASIK). What pulse duration and Q-factor are required to avoid thermal damage to surrounding tissues?" • **Goal:** Students must synthesize their knowledge of **Pulse Duration** and **Peak Power** to propose a technical solution. **4. Computer-Aided Simulation & Visualization** • **Method:** Using computational tools like **MATLAB, Python, or OptiWave**. • **Activity:** Simulating the evolution of a laser pulse within a cavity. Students can visually witness how changing the **Saturable Absorber** parameters affects the giant pulse formation. **5. Inquiry-Based Learning (IBL)** • **Method:** Moving from "Giving Answers" to "Asking the Right Questions." • **Example:** Instead of explaining the M^2 factor, provide two different beam profiles and ask: "Based on the diffraction limit, which beam will focus to a smaller spot size and why?" **6. Peer-to-Peer Instruction (Mazur Method)** • **Method:** Concept questions (ConceptTests) are posed during the lecture. • **Activity:** Students vote on an answer, discuss it with their neighbor (peer-instruction), and then revote. This is highly effective for abstract concepts like **Phase Matching** in Non-Linear Optics.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**72**	**Unstructured SWL (h/w)** ال 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)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	4	20% (10)	13	All
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to the Course & Review of Resonator Stability.
Week 2	The Q-Factor: Definition, energy storage, and loss mechanisms.
Week 3	**Active Q-Switching (I):** Mechanical (Rotating mirrors) and Acousto-Optic modulators.
Week 4	**Active Q-Switching (II):** Electro-Optic effects (Pockels and Kerr Cells).
Week 5	**Passive Q-Switching:** Saturable absorbers and rate equation modeling for giant pulses.
Week 6	**Passive Mode-Locking:** Kerr-Lens Mode-locking (KLM) and SESAMs.
Week 7	Pulse Characterization: Autocorrelation and Group Velocity Dispersion (GVD).
Week 8	Test 1
Week 9	1- Introduction to Non-Linear Susceptibility ($\chi^{(2)}$ and $\chi^{(3)}$ processes). 2- Second Harmonic Generation (SHG) and Phase-Matching conditions.
Week 10	• Gaussian Beam Propagation and the M^2 Factor. • Laser-Matter Interaction: Ablation, Plasma formation, and Thermal effects.
Week 11	**Industrial & Medical Applications:** LIDAR, Laser Surgery, and Additive Manufacturing (3D Printing).
Week 12	**Industrial & Medical Applications:** LIDAR, Laser Surgery, and Additive Manufacturing (3D Printing).
Week 13	**Industrial & Medical Applications:** LIDAR, Laser Surgery, and Additive Manufacturing (3D Printing).
Week 14	Final Review & Student Project Presentations.
Week 15	Desiccation
Week 16	**Final Test**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Acquaint students with the knowledge of laboratory Laser and devices used in the laboratory, and how to write reports after conducting experiments
Week 2	Measurement of Red Blood Cell Diameter Using a Laser
Week 3	Determining the Thickness of a Wire
Week 4	Determine the Diameter of a Circular Hole
Week 5	Study the Characteristics of LDR By Using Power Meter
Week 6	Exam
Week 7	Study the Characteristics of LDR By Using Avometer
Week 8	Measuring the Wavelength of a Laser Beam Using Michelson Interferometer
Week 9	Calculating the Refractive Index of Transparent Materials Using a Laser
Week 10	Calculating the Refractive Index of Liquid Materials Using a Laser
Week 11	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Principles of Lasers** – *Orazio Svelto* (Springer) https://www.google.com/search?q=https://link.springer.com/book/10.1007/978-1-4419-1301-2	Not evaluable
Recommended Texts	**Lasers** – *Anthony E. Siegman* (University Science Books)	Evaluable
Websites	https://www.rp-photonics.com/encyclopedia.html	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Environment & Pollution**			**Module Delivery**	
Module Type	**Elective learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒**Seminar**	
Module Code	**PHY-326**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**UGIII**		**Semester of Delivery**	**6**	
Administering Department	Physics		**College**	Sciences	
Module Leader	Maitham Salman Amana		**e-mail**	malsalem@uowasit.edu.iq	
Module Leader's Acad. Title	Assist. Prof		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	malsalem@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	**1-2-2026**		**Version Number**	**1**	

Relation with other Modules العالقة 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 اهداف المادة الدراسية	1. Introduce students to the fundamental concepts of environmental pollution from a physical science perspective. 2. Provide a scientific understanding of the sources and types of pollutants affecting air, water, and soil. 3. Explain the physical mechanisms governing transport, dispersion, and accumulation of environmental pollutants. 4. Familiarize students with basic environmental monitoring and measurement techniques used in pollution assessment. 5. Develop students' ability to analyze environmental pollution problems using physical principles. 6. Highlight the health, ecological, and environmental impacts of pollution. 7. Emphasize the role of physicists in environmental protection and sustainable development.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	Upon successful completion of this course, students will be able to: 1. Define and classify different types of environmental pollutants. 2. Describe the physical processes involved in air, water, and soil pollution. 3. Explain pollutant transport mechanisms such as diffusion, advection, and deposition. 4. Identify common techniques and instruments used for environmental pollution measurements. 5. Interpret environmental data and compare results with national and international environmental standards. 6. Assess the potential health and environmental effects of physical pollutants, including natural radioactivity. 7. Apply basic physical models to analyze real environmental pollution scenarios. 8. Demonstrate awareness of environmental protection strategies and sustainable development principles.
Indicative Contents المحتويات الارشادية	1. Theoretical Foundations of Environmental Pollution: This course covers the fundamental concepts of environmental pollution, including definitions, classifications (physical, chemical, and biological pollution), sources (natural and anthropogenic), and the behavior of pollutants in air, water, and soil. It also introduces the physical principles governing pollutant transport such as diffusion, advection, dispersion, and mass balance in environmental systems. 2. Measurement, Monitoring, and Analytical Techniques: This course addresses environmental sampling methods and pollution assessment techniques. It includes measurement of physical parameters (temperature, turbidity, electrical conductivity), chemical indicators (pH, dissolved oxygen, BOD, COD, heavy metals), and radiological contaminants in water and soil. The course also introduces environmental monitoring instruments, basic statistical analysis, and data interpretation.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	• Structured theoretical lectures supported by visual presentations and scientific illustrations. • Interactive classroom discussions to enhance conceptual understanding of pollution processes. • Problem-solving sessions involving quantitative environmental calculations (e.g., diffusion, advection, mass balance). • Laboratory and practical activities for environmental sampling and water quality measurements. • Data analysis exercises using basic statistical methods. • Case studies addressing real environmental pollution problems. • Research assignments and short reports to develop scientific writing skills. • Continuous assessment through quizzes, assignments, and classroom participation. • Constructive feedback to improve academic performance and critical thinking skills.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**52**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments @ homework	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	seminar	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to environmental pollution, Definitions, types, and sources of pollution
Week 2	Water pollution fundamentals, Physical water quality parameters
Week 3	Soil pollution, Physical soil quality parameters
Week 4	Air Pollution
Week 5	Thermal Pollution
Week 6	Noise Pollution
Week 7	Radiological (Ionizing) Pollution
Week 8	Biological effects of radiation on cells and tissues and Medical Radiation Sources
Week 9	Radiation detectors, analytical methods for measuring radioactivity in various samples.
Week 10	Radiation doses (absorbed, effective, equivalent) and their units. Comparison of Radiation Doses
Week 11	Principles of Radiation Protections
Week 12	Methods for maximizing distance from sources of radiation
Week 13	Basic principles of radiation protection: Proper uses of shielding
Week 14	Practical applications of radiation protection in medicine, industry, and scientific research.
Week 15	Applications of radiation
Week 16	**Preparatory Week Before the Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	***-Sherer, M. A. S., Visconti, P. J., Ritenour, E. R., & Haynes, K. (2021). Radiation protection in medical radiography. Elsevier Health Sciences.*** ***-Bushong, S. C., & Goerner, F. (2012). Radiology science for technologists. Elsevier Health Sciences.***	No
Recommended Texts	***-Limbacher, M., Douglas, P. S., & Germano, G. (1998). Radiation safety in the practice of cardiology. Journal of the American College of Cardiology, 31(4), 892-915.***	No
Websites		

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
	A - Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors

Success Group (50 - 100)	**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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Physical Optics**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☒**Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-321**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**UGIII**		**Semester of Delivery**	**6**	
Administering Department	Physics		**College**	Sciences	
Module Leader	Eidan Asi Abdullah Efan		**e-mail**	eidan@uowasit.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D. in Laser & Electro-Optics Physics	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	01/02/2026		**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	**PHY-311 (Geometrical Optics)**	**Semester**	**5**
Co-requisites module	**Lab. of Physical Optics**	**Semester**	**6**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. Introduce the wave model of light and its fundamental principles. 2. Develop understanding of interference and diffraction phenomena. 3. Study thin-film interference and related applications. 4. Analyze diffraction from single slits and diffraction gratings. 5. Introduce polarization as evidence of the transverse nature of light.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. State and apply the conditions for interference. 2. Analyze Young's double-slit experiment quantitatively. 3. Determine positions of bright and dark fringes. 4. Explain phase change due to reflection. 5. Solve thin-film interference problems including Newton's rings. 6. Derive and apply single-slit diffraction conditions. 7. Use diffraction gratings to determine wavelengths. 8. Explain polarization and its physical meaning.
Indicative Contents المحتويات الارشادية	1. Conditions for Interference 2. Young's Double-Slit Experiment 3. Phase Change Due to Reflection 4. Thin Film Interference and Newton's Rings 5. Diffraction and Single-Slit Diffraction 6. Diffraction Grating and Spectrometer 7. Polarization of Light Waves

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lectures supported by diagrams and simulations, laboratory sessions to study reflection, refraction, and image formation, weekly problem-solving exercises, and the use of optical simulation software.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**78**	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**72**	**Unstructured SWL (h/w)** **ال 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)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	2	20% (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	Wave Nature of Light
Week 2	Conditions for Interference
Week 3	Young’s Double-Slit Experiment
Week 4	Fringe Equations and Applications
Week 5	Phase Change on Reflection
Week 6	Thin Film Interference
Week 7	Midterm Exam

Week 8	Newton's Rings
Week 9	Introduction to Diffraction
Week 10	Single-Slit Diffraction
Week 11	Diffraction Intensity Distribution
Week 12	Diffraction Grating
Week 13	Grating Applications
Week 14	Polarization
Week 15	Revision and Review
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Acquaint students with the knowledge of laboratory optics and devices used in the laboratory, and how to write reports after conducting experiments
Week 2	Determining the Absorption Coefficient of Thin Films Using a Laser
Week 3	Determine the transmittance, absorbance, and reflectance of glass Using a Laser
Week 4	Newton's Rings
Week 5	Optical Activity
Week 6	Exam
Week 7	Studying beam of light diffraction by using diffraction grating
Week 8	Calculation the resolving power of diffraction grating with respect to a specific spectral line for ranked first and second.
Week 9	Measuring angle of minimum deviation of different spectrum colors by prism
Week 10	Find the refraction coefficients of prism material for different spectrum colors
Week 11	Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Optics, 4th Edition – Francis A. Jenkins & Harvey E. White.	Yes
Recommended Texts	College Physics, 7th Edition – Raymond A. Serway.	No
Websites	https://www.photonics.com https://www.wolframalpha.com https://physics.info/optics	

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
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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Geometrical Optics**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-311**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**UGIII**		**Semester of Delivery**	**5**	
Administering Department	Physics		**College**	Sciences	
Module Leader	Eidan Asi Abdullah Efan		**e-mail**	eidan@uowasit.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D. in Laser & Electro-Optics Physics	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	**01/08/2025**		**Version Number**	**1.0**	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	**Lab.of Geometrical Optics**	**Semester**	**5**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. Introduce the basic principles of geometrical optics, reflection, and refraction laws. 2. Enable students to analyze and interpret optical systems using geometrical models. 3. Study image formation in mirrors and lenses using thin and thick lens equations. 4. Familiarize students with basic optical instruments such as microscopes and telescopes. 5. Develop problem-solving skills for optical system design and analysis.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Explain the basic principles of light reflection and refraction using Fermat's and Snell's laws. 2. Analyze optical systems composed of lenses and mirrors. 3. Calculate image position and magnification in various optical systems. 4. Apply equations for spherical and aspherical mirrors and lenses. 5. Describe the performance and operation of common optical instruments. 6. Use ray diagrams to study image formation. 7. Link theoretical principles with experimental results.
Indicative Contents المحتويات الارشادية	- Part A – Fundamentals: Nature of Light, Ray Approximation, Laws of Reflection and Refraction, Fermat's Principle, Plane and Spherical Mirrors, Image Formation, Thin Lenses, Lens Maker's Formula, Combination of Lenses, Principal Planes. - Part B – Applications: Optical Instruments (Microscope, Telescope, and Cameras), Thick Lenses and Optical Aberrations, Fiber Optics: Basic Geometrical Principles, Introduction to Optical Design Methods.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Lectures supported by diagrams and simulations, laboratory sessions to study reflection, refraction, and image formation, weekly problem-solving exercises, and the use of optical simulation software.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**78**	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم 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)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	2	20% (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 Geometrical Optics – Nature of Light
Week 2	Laws of Reflection and Refraction – Fermat's Principle
Week 3	Plane Mirrors and Image Formation
Week 4	Spherical Mirrors – Ray Diagrams
Week 5	Thin Lenses – Lens Maker's Equation
Week 6	Combination of Lenses – Principal Planes
Week 7	Midterm Exam

Week 8	Optical Instruments – Microscopes
Week 9	Optical Instruments – Telescopes and Cameras
Week 10	The Human Eye
Week 11	Thick Lenses and Optical Aberrations
Week 12	Fiber Optics
Week 13	Geometrical Model and Applications (fiber)
Week 14	Image Quality and Resolution
Week 15	Revision and Review
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	**Acquaint students with the knowledge of laboratory optics and devices used in the laboratory, and how to write reports after conducting experiments**
Week 2	Determine the focal length of a concave mirror By locating the center of curvature
Week 3	Determine the focal length of a concave mirror By a graphical method
Week 4	Finding the focal length of a convex lens by a graphical method
Week 5	By means of a spectrometer to measure: The refractive index of the glass of a prism for Sodium light
Week 6	**Exam**
Week 7	Measure the refractive index of water using a Moving microscope
Week 8	Measure the refractive index of glass using a Moving microscope
Week 9	Measure Brewster's angle
Week 10	Measure the index of refraction of transparent material
Week 11	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Optics, 4th Edition – Francis A. Jenkins & Harvey E. White.	Yes
Recommended Texts	College Physics, 7th Edition – Raymond A. Serway.	No
Websites	https://www.photonics.com https://www.wolframalpha.com https://physics.info/optics Thin Lens & Mirror Simulator – Eidan A. Abdullah	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Solar Energy**			**Module Delivery**	
Module Type	**Elective learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-316**				
ECTS Credits	4				
SWL (hr/sem)	**100**				
Module Level	**UGIII**		**Semester of Delivery**		**5**
Administering Department	Physics		**College**	Sciences	
Module Leader	Dr Mohanad Sarai Atab		**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		PhD
Module Tutor	Dr Mohanad Sarai Atab		**e-mail**	matab@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	**1-9-2025**		**Version Number**		1.0

Relation with other Modules العالقة 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 اهداف المادة الدراسية	1. Introduce students to solar energy systems and fundamentals 2. Improve the student's skills to match the work market 3. Develop the students' abilities in solar energy applications
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Enable students to learn solar energy stations 2. Teach students heating and cooling systems 3. Enable students to set up photovoltaic 4. Enable students of how to use thermal insulations
Indicative Contents المحتويات الارشادية	1. Academic Guidance: explaining the academic system (credit hours and regulations) 2. Psychological counseling: supports students mental health and emotional well-being and also stress and anxiety management 3. Social Guidance: helps students adapt to university life and develop interpersonal skills.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	These are techniques students use to understand and retain information: • **Active Learning**: Engaging directly with material through discussion, practice, or teaching others. • **Note-taking Methods**: Cornell notes, mind maps, or digital annotation. • **Metacognition**: Reflecting on how one learns best and adjusting strategies accordingly. • **Self-testing**: Using flashcards or practice quizzes to reinforce memory. • **Collaborative Learning**: Studying in groups to share perspectives and clarify concepts.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**52**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	1	20% (10)	13	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of renewable energies
Week 2	Solar energy collectors
Week 3	Performance of solar collectors
Week 4	Solar water heating system
Week 5	Solar space heating
Week 6	Cooling principles
Week 7	Photovoltaic systems

Week 8	Solar thermal power
Week 9	Exam
Week 10	Solar thermal power systems
Week 11	System Designing
Week 12	System modeling
Week 13	Solar economic analysis
Week 14	Solar collector calculations
Week 15	Summative exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Solar Energy Engineering 2. Photovoltaic Solar Energy Systems - The Solar Resource	no
Recommended Texts	Solar energy principles	no
Websites	https://www.top50-solar.de/en?utm_source=copilot.com	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية			
Module Title	**Semiconductor**	**Module Delivery**	
Module Type	**Basic learning activities**	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-315**		
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level	**UGIII**	**Semester of Delivery**	**5**
Administering Department	Physics	**College**	Sciences
Module Leader	Mahdi Ahmed Mohammed	**e-mail**	mahmed@uowasit.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	mahmed@uowasit.edu.iq
Peer Reviewer Name		**e-mail**	
Scientific Committee ApprovalDate	01/06/2025	**Version Number**	1.0

Relation with other Modules العالقة 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 اهداف المادة الدراسية	1. Enable the student to know the basics of semiconductor materials. 2. Knowledge of the physical properties of semiconductor materials. 3. Knowing the doped materials and studying the effect of the amount of doping and temperature on the conductivity of the material. 4. How to use mathematical equations and mathematical derivations to calculate the physical parameters of semiconductor materials. 5. Know the importance of semiconductor materials in electronic applications.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. The ability to logically analyze. 2. The ability to understand the electronic structure of pure and doped semiconductor materials. 3. The ability to employ the principle of quantum mechanics to obtain special mathematical equations to calculate the physical parameters of semiconductor materials.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Bandgap, Effective mass of electrons and holes, Density of states, Femi level, Carrier concentration, Extrinsic semiconductor. Part B – application Mobility, Current, Effect of donor and acceptor impurities, Freeze-Out

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lectures and Conceptual Explanation: Use interactive lectures supported with visual aids (band diagrams, Fermi levels, energy gaps). Relate semiconductor theory to real-world applications such as solar cells, LEDs, and microprocessors. 2. Active Learning Techniques: There are different techniques for example, pose conceptual questions (e.g., “Why does doping change conductivity?”), let students discuss, then share answers. 3. Assessment Strategies: Use formative assessments: quizzes, in-class problem-solving, and peer feedback. 4. Blended and Technology-Enhanced Learning: assign video lectures or readings on band theory, then solve problems in class. 5. Critical Thinking and Innovation Focus: Encourage students to compare traditional semiconductors (Si, Ge) with emerging nanomaterials (perovskites, graphene, rGO composites). Discuss sustainability issues (e-waste, green fabrication methods).

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	52	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	1	20% (10)	13	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Classification of Solids, Atomic Structure of Semiconductors
Week 2	Classification of solid materials depending on the band gap
Week 3	Effective Mass
Week 4	Density of states
Week 5	Fermi-Dirac distribution
Week 6	Carrier concentration in semiconductors
Week 7	Midterm Exam

Week 8	Fermi Level location of Intrinsic Semiconductor
Week 9	Drift: Mobility of carriers
Week 10	The Currents in Semiconductors
Week 11	Extrinsic semiconductor
Week 12	Effect of donor and acceptor impurities on carrier concentration
Week 13	Effect of temperature on carrier concentration
Week 14	Complete Ionization and Freeze-Out
Week 15	Some applications
Week 16	**Preparatory Week Before The Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Semiconductor Materials: An Introduction to Basic Principles (B. G. Yacobi)	No
Recommended Texts	Modern Semiconductor Devices for Integrated Circuits (Chenming Calvin Hu)	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

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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Quantum Mechanics 1**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-313**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**UGIII**		**Semester of Delivery**	**5**	
Administering Department	Physics		**College**	Sciences	
Module Leader	Prof.Dr. Hadi D. Alattabi		**e-mail**	alattabih@uowasit.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	alattabih@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	1-6-2025		**Version Number**		

Relation with other Modules العالقة 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 اهداف المادة الدراسية	1. This course deals with the basic of concepts for quantum mechanics 2. To describe types of solutions of Schrodinger equations 3. To understand the wave functions 4. To understand the differences between quantum mechanics and classical mechanics 5. To explain the relationships from quantum mechanics in modern physics
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Recognize the difference between quantum mechanics and classical mechanics 2. Recognize Type of function operators 3. Discuss the derivative of special functions of electron in one dimensions of plane wave equation 4. Summarize what is meant by a basic equations in quantum mechanics 5. understand the properties of the wave equations 6. know the normalize constant 7. Define the operators 8. Identify the basic of some applications in quantum mechanics systems 9. Discuss the derivative of Schrodinger equations depend on the time 10. Discuss the eigenvalues and the Eigen functions
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Wave function , operators, uncertainty , deBrolie equation ,Schrodinger equations dependent and independent on the time Part B – application Properties of operators, fined the solutions of wave functions from Schrodinger equations dependent and independent on the time , applications to find the results of quantum mechanics and classical mechanics , moment operators, derivatives of hamitloniun operators

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy for student's participation by using discussion and interactive lecture.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	2	20% (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	Elementary properties of Quantum Mechanics
Week 2	Derivatives of Shrodingers Equation
Week 3	The Shrodingers wave equation-operators
Week 4	The Shrodingers wave equation-operators
Week 5	Normalized functions
Week 6	Eigenvalues and Eigen functions of X and PX
Week 7	Expectation values-variance

Week 8	Eigen functions and constants of the motion
Week 9	Prove the first result when the expectation value of total energy equal kinetic energy and potential energy.
Week 10	prove the first derivatives of X expect for the time equal the expectation of moment divide to m.
Week 11	The meaning of physics of Greens theories
Week 12	Solution of line-dependent Shrodingers Equation
Week 13	Solution of line-dependent Shrodingers Equation
Week 14	Properties of energy levels and ware functions- degeneracy.
Week 15	Properties of energy levels and ware functions-degeneracy
Week 16	**Preparatory Week Before The Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Quantum mechanics Dr.Jassim mohammed and Abdalsalam	Yes
Recommended Texts	University of Baghdad	Yes
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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Quantum Mechanics II**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-323**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**UGIII**		**Semester of Delivery**		6
Administering Department	Physics		**College**	Sciences	
Module Leader	Prof.Dr. Hadi D. Alattabi		**e-mail**	alattabih@uowasit.edu.iq	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	alattabih@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	**1-2-2026**		**Version Number**		

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	**PHY-313**	**Semester**	**5**
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. Explain the expectation value of total energy equal to the expectation value of the kinetic energy plus potential energy 2. To describe types of solutions of Schrodinger equations ,with Green theorem 3. To understand the wave functions ,for electrons in direction x 4. To understand the differences between quantum mechanics and classical mechanic 5. To explain the relationships from quantum mechanics in modern physics
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Recognize the difference between quantum mechanics and classical mechanics 2. Recognize Type of function operators 3. Discuss the derivative of special functions of electron in one dimensions of plane wave equation 4. Summarize what is meant by quantized states 5. understand the properties of the reflection operator 6. know the normalize constant 7. Define the parity in quantum mechanic 8. Identify the basic of some applications in quantum mechanics systems 9. Discuss the derivative of Schrodinger equations depend on the time 10. Discuss the eigenvalues and the eigenfunctions and comparing of the total energy for hydrogen atom
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Linear harmonic oscillator Wave function , operators, uncertainty , deBrolie equation Schrodinger equations dependent and independent on the time, The Hamiltonian function Part B – application Properties of operators, fined the solutions of wave functions from Schrodinger equations dependent and independent on the time , applications to find the results of quantum mechanics and classical mechanics , moment operators, derivatives of Hamiltonian operators.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy for student's participation by using discussion and interactive lecture.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	2	20% (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	Comparison between the results for in quantum mechanics of expectation values for and total energy
Week 2	Comparison between the results for in quantum mechanics of expectation values for and total energy
Week 3	Comparison between the results for in quantum mechanics of expectation values for and total energy in result 1,2 and 3
Week 4	Introduction for linear harmonic oscillator
Week 5	The Hamiltonian function in Schrodinger equation
Week 6	Solution the Sch. Eq.for linear harmonic oscillator
Week 7	Study the Hermits polynomials

Week 8	Apply the Green theory in solution of Q.M
Week 9	Fined the wave function by using Sch.eq
Week 10	Properties of energy levels and wave function /degeneracy.
Week 11	To define degenerate level , degree of degeneracy .
Week 12	To prove the all values of energy are real
Week 13	To prove the normalize and orthogonal of the wave function in Q.M
Week 14	To explain how can use the series of wave function in Q.M.
Week 15	Properties of operators.
Week 16	**Preparatory Week Before The Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Quantum mechanics Dr.Jassim mohammed and Abdalsalam	Yes
Recommended Texts	University of Baghdad	Yes
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.

MODULE DESCRIPTION
وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Molecular Physics**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-325**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**UGIII**	**Semester of Delivery**		6
Administering Department		Physics	**College**	Sciences	
Module Leader	Ali Karrim Aboud Mohammed		**e-mail**	ahatab@uowasit.edu.iq	
Module Leader's Acad. Title		Lecture	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		1/02/2026	**Version Number**		1.0

Relation with other Modules العالقة 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 اهداف المادة الدراسية	1. Providing learners with knowledge of the principles of molecular physics and molecular models 2. Developing positive attitudes toward molecular spectra and their applications 3. Learn about research methods in molecular physics 4. Learn the basic concepts of rotational, vibrational, and electronic energy of molecules 5. Identify the basic trends in molecular spectra and selection rules 6. Identify the objectives of molecular spectroscopy and its role in applied sciences 7. Develop learners' knowledge of the historical development of molecular physics and quantum mechanics 8. Identify the components of the basic properties of diatomic and polyatomic molecules 9. Identify the basic information of molecular models (Rigid Rotator, Harmonic and Anharmonic Oscillator) 10. Gain theoretical knowledge of quantum rotational energy and its levels 11. Identify absorption and emission spectra of molecules in the infrared region 12. Evaluate the vibration-rotation spectrum of diatomic molecules 13. Gain skills in molecular spectroscopy instruments and Raman spectroscopy techniques 14. Apply quantum mechanics models (Schrödinger equation) to diatomic and polyatomic molecules 15. Understand the role of the electronic structure of molecules in determining their spectral properties
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Knowledge of quantum theory and the atomic structure of molecules 2. Knowledge of the Rigid Rotator model and its application to diatomic molecules 3. Knowledge of quantum rotational energy levels $F(J) = BJ(J+1)$ and selection rule $\Delta J = \pm 1$ 4. Knowledge of the Boltzmann distribution for the population of rotational levels and the effect of temperature 5. Knowledge of the Non-Rigid Rotator model and centrifugal distortion constant D 6. Knowledge of harmonic and anharmonic vibrational energy of molecules and their constants 7. Knowledge of the vibration-rotation spectrum of diatomic molecules and P, R branches 8. Knowledge of the molecular absorption spectrum in the infrared region and emission spectrum 9. Knowledge of Raman spectrum, its principle, and selection rules $\Delta J = 0, \pm 2$ 10. Knowledge of vibration-rotation spectra of polyatomic molecules (linear and symmetric top) 11. Knowledge of the Born-Oppenheimer approximation and its effect on energy levels 12. Knowledge of the electronic spectrum of molecules and dissociation energy 13. Knowledge of molecular orbital theory and the electronic structure of diatomic molecules 14. Knowledge of the basic components of spectroscopic devices used in molecular physics 15. Knowledge of absorption, emission, and scattering (Raman) measurement devices and their practical applications
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Part B – application

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The initial strategy adopts a step-by-step approach, starting with basic quantum mechanical principles and progressing to complex spectral phenomena, advancing from simple diatomic molecular systems to complex polyatomic molecular structures, covering rotational, vibrational, and electronic energy levels and their associated spectra.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**52**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	2	20% (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

Week	Material Covered
Week 1	Quantum Theory and Atomic Structure of Molecules
Week 2	Types of Molecules and Moments of Inertia
Week 3	Rotational Energy — Rigid Rotator Model
Week 4	Rotational Spectrum and Selection Rules
Week 5	Population of Rotational Energy Levels
Week 6	Non-Rigid Rotator and Centrifugal Distortion
Week 7	Vibrational Energy — Harmonic Oscillator
Week 8	Anharmonic Oscillator and Morse Potential
Week 9	Vibration-Rotation Spectrum of Diatomic Molecules
Week 10	Born-Oppenheimer Approximation and Coupled Energy Levels
Week 11	Raman Spectrum — Principle and Selection Rules
Week 12	Vibration-Rotation Spectra of Polyatomic Molecules
Week 13	Electronic Structure of Molecules — Molecular Orbital Theory
Week 14	Electronic Spectra and Dissociation Energy
Week 15	Basic Components of Molecular Spectroscopic Devices
Week 16	Preparatory Week Before the Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• Banwell, C. N., & McCash, E. M. (1994). *Fundamentals of Molecular Spectroscopy*, 4th Edition. McGraw-Hill. • Atkins, P., & Friedman, R. (2011). Molecular Quantum Mechanics, 5th Edition. Oxford University Press.	No
Recommended Texts	• Herzberg, G. (1989). *Molecular Spectra and Molecular Structure — Vol. I: Diatomic Molecules*. Krieger Publishing. • Hollas, J. M. (2023). *Modern Spectroscopy*, 4th Edition. Wiley-Blackwell.	No
Websites	• HITRAN Molecular Database: https://hitran.org	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Material Physics I**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-314**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIII**	**Semester of Delivery**		**5**
Administering Department		**Physics**	**College**	Sciences	
Module Leader	**Najwa Jassim Jubier Abbas**		**e-mail**	njassim@uowasit.edu.iq	
Module Leader's Acad. Title		**Professor**	**Module Leader's Qualification**		Ph.D.
Module Tutor	**N/A**		**e-mail**		
Peer Reviewer Name		**N/A**	**e-mail**		
Scientific Committee ApprovalDate		**01/06/2025**	**Version Number**		**1.0**

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	**Lab. of material physics**	**Semester**	**5**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	This module aims to provide students with a fundamental understanding of the structure of materials, including crystalline and amorphous solids, crystal lattices, and unit cell geometry. It introduces the principles of crystallography such as Bravais lattices, Miller indices, and packing in solids. The module also aims to develop knowledge of crystal diffraction techniques, including X-ray diffraction and Bragg's law, and the concept of reciprocal lattices and Brillouin zones. In addition, it covers different types of atomic bonding, both primary and secondary, and their influence on material properties. Overall, the module prepares students to analyze crystal structures and understand the relationship between atomic arrangement and material behavior.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	-Knowledge & Understanding By the end of this course, students will be able to: 1. Describe the fundamental concepts of materials physics, including crystalline and amorphous solids. 2. Explain crystal structures, Bravais lattices, and unit cell parameters. 3. Identify different types of cubic structures and calculate their volumes and properties. 4. Define Miller indices for planes and directions and explain their physical significance. **Cognitive Skills** 5. Analyze crystal structures using lattice geometry and symmetry considerations. 6. Calculate angles between planes and directions using Miller indices. 7. Evaluate packing factor and density in different crystal structures. **Practical and Technical Skills** 8. Apply Bragg's law to determine interplanar spacing and X-ray wavelength. 9. Interpret diffraction patterns obtained from X-rays, electrons, and neutrons. 10. Use reciprocal lattice concepts to analyze diffraction conditions and crystal properties.
Indicative Contents المحتويات الارشادية	Indicative Content – Advanced Materials Physics This module covers the fundamental concepts of material physics, including the distinction between crystalline and amorphous materials and the principles of crystal structures such as Bravais lattices, lattice translation vectors, and unit cell geometry. It introduces two- and three-dimensional lattices, types of cubic structures, and the calculation of density and atomic packing factor. The module also addresses Miller indices for planes and directions and the determination of angles between them. Close-packed structures, particularly hexagonal close-packed systems, are discussed in relation to material properties. In addition, the course explores crystal diffraction using X-rays, electrons, and neutrons, including Bragg's law and its applications in determining interatomic distances. The concept of reciprocal lattices, diffraction conditions, and Brillouin zones is also included. Finally, the module examines types of atomic bonding, including primary and secondary bonds, and their influence on material behavior, along with revision and examination components.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	The module will be delivered through a combination of lectures to present core theoretical concepts in material physics and crystallography, supported by interactive discussions and problem-solving sessions to reinforce understanding. Visual aids, diagrams, and simulations will be used to illustrate crystal structures, Miller indices, and diffraction principles. Practical demonstrations and exercises will familiarize students with techniques such as X-ray diffraction and reciprocal lattice analysis. Students are encouraged to engage in self-directed learning through exercises and assignments, while their progress is assessed through formative activities, quizzes, a midterm exam, and a final examination.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** ال 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)	4,9	All
	Assignments&H.W	**2**	10% (10)	3,10	All
	Projects / Lab.	**1**	10% (10)	Continuous	All
	Report	**1**	10% (10)	12	All
Summative assessment	**Midterm Exam**	**2 hr**	10% (10)	8	All
	Final Exam	**3hr**	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to material physics
Week 2	Crystal structure(crystalline and amorphous material) the crystalline of solids Baravais lattice and crystal translation vectors, elements of crystal structure
Week 3	Two and three dimensional lattices, type of cubic and volume of cubic
Week 4	Indices of the faces. Miller indices of direction and the angle between two planes and two directions.
Week 5	Miller indices of direction and the angle between two planes and two directions.
Week 6	Density and packing factor
Week 7	Close packed structures, hexagonal close packed structures
Week 8	Midterm Exam
Week 9	Crystal diffraction, the incident beam used for crystal diffraction, X-rays, neutron, electron.
Week 10	Bragg law, determination of X-ray wave length, and inter atomic distance
Week 11	Exercises
Week 12	Reciprocal lattice concept ,Reciprocal lattice vectors, Diffraction Conditions ,Brillouin zones and Bragg law
Week 13	Reciprocal Lattice to S.C Lattice, Reciprocal Lattice to bcc Lattice,Reciprocal Lattice to fcc Lattice
Week 14	Types of Bonding, Primary bonding
Week 15	Secondary bonding
Week 16	Preparatory Week Before The Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Acquaint students with the knowledge of laboratory materials and devices used in the laboratory, and how to write reports after conducting experiments
Week 2	Introduction to Materials Physics, Types of Materials, and Classification Based on Their Properties and Nature
Week 3	Crystal structures of Materials
Week 4	Crystal Lattices
Week 5	Types of Samples and Sample Preparation for Testing
Week 6	Grain Size Analysis by Dry Sieving
Week 7	Polymers and Their Preparation
Week 8	Composites and Their Preparation

Week 9	**Structural properties (X-RAY)**
Week 10	**Review of Previous Experiments**
Week 11	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**1-Introduction to Solid State Physics BY** Charles Kittel **2- solid state physics** **3-علم المواد د. متي ناصر مقاديسي**	Yes
Recommended Texts	**Materials Science and Engineering An Introduction**	No
Websites	https://mrcet.com/downloads/digital_notes/ME/II%20year/MATERIAL%20SCIENCE.pdf	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Material Physics II**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-324**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIII**	**Semester of Delivery**		**6**
Administering Department		**Physics**	**College**	Sciences	
Module Leader	**Najwa Jassim Jubier Abbas**		**e-mail**	njassim@uowasit.edu.iq	
Module Leader's Acad. Title		**Professor**	**Module Leader's Qualification**		Ph.D.
Module Tutor	**N/A**		**e-mail**		
Peer Reviewer Name		**N/A**	**e-mail**		
Scientific Committee ApprovalDate		**01/02/2026**	**Version Number**		**1.0**

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	**PHY-314**	**Semester**	**5**
Co-requisites module	**Lab. of material physics**	**Semester**	**6**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	**This module aims to:** • Provide a fundamental introduction to bonding in solids, particularly ionic bonding and ionic cohesive energy. • Develop a clear understanding of phase stability, phase equilibria, and phase transformations in materials. • Introduce phase equilibrium diagrams and enable students to interpret cooling curves and eutectic systems. • Explain solid solutions and interstitial phases and their role in determining material properties. • Present the principles of rate processes, crystallization, and the kinetics of phase transformations, including nucleation and growth mechanisms. • Familiarize students with nucleation kinetics, heterogeneous nucleation, nucleation rate, and crystal growth behavior. • Develop knowledge of mechanical properties of materials, including stress–strain relationships, true stress–strain curves, shear stress and strain, Poisson's ratio, hardness, toughness, and types of fracture. • Introduce key experimental techniques used in materials characterization, including thermal analysis methods (DTA, DSC, and DMS), elemental analysis (EDS), and microscopy (SEM, AFM). • Enable students to link material structure with physical and mechanical properties and interpret experimental results. • Prepare students for examinations and further study in materials science and related fields.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	**Knowledge and Understanding** 1. Explain the concept of ionic bonding and ionic cohesive energy in solids. 2. Describe phase stability, phase equilibria, and phase transformations. 3. Identify and interpret phase equilibrium diagrams, including eutectic systems and cooling curves. 4. Explain solid solutions and interstitial phases and their effects on material behavior. Cognitive Skills 5. Analyze phase diagrams to predict phase composition and transformations under different conditions. 6. Evaluate the kinetics of phase transformations, including nucleation and growth mechanisms. 7. Differentiate between homogeneous and heterogeneous nucleation and their significance. Practical and Technical Skills 8. Apply knowledge of mechanical properties such as stress–strain

	relationships, hardness, toughness, and fracture behavior. 9. Interpret true stress–strain curves and mechanical performance of materials. 10. Utilize and interpret results from experimental techniques such as DTA, DSC, DMS, EDS, SEM, and AFM.
Indicative Contents المحتويات الارشادية	Indicative Content – Advanced Materials Physics • Relationship between atomic structure, bonding, and material performance • Crystal Structures and Bonding • Enthalpy, entropy, and Gibbs free energy concepts • Thermodynamic stability and phase diagrams • Phase transitions, melting points, glass transitions • Cooling Behavior and Eutectic Systems • Kinetics of Phase Transformations • Mechanical Properties of Materials • Stress–strain relationships • Elastic and plastic deformation • Hardness, toughness, and ductility • Fracture mechanics and fatigue • Thermal Analysis and Thermodynamics • Thermal analysis techniques: DSC, TGA, DTA • Applications and Case Studies • Material selection for engineering and functional applications

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This module is delivered through a combination of lectures to present core theoretical concepts, supported by interactive discussions and in-class problem-solving to enhance student understanding. Visual aids and diagrams are used to clarify complex topics such as phase transformations and material behavior. Practical demonstrations of material characterization techniques, including DTA, DSC, EDS, SEM, and AFM, are incorporated where possible. In addition, students are encouraged to engage in self-directed learning through assignments, while their progress is evaluated through continuous assessment, quizzes, and examinations.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	72	**Unstructured SWL (h/w)** ال 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)	4,9	All
	Assignments&H.W	**2**	10% (10)	3,10	All
	Projects / Lab.	**1**	10% (10)	Continuous	All
	Report	**1**	10% (10)	12	All
Summative assessment	**Midterm Exam**	**2 hr**	10% (10)	8	All
	Final Exam	**3hr**	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction and ionic cohesive energy**
Week 2	**ionic cohesive energy Phase equilibrium diagrams**
Week 3	**Stability of phases and equilibiria, Phase transformation**
Week 4	**Solid solutions, interstitial phases**
Week 5	**Phase equilibrium diagrams**
Week 6	**Cooling curves, Eutectic systems**
Week 7	**Rate process and crystallization ,kinetics of phase transformation, nucleation and growth,**

Week 8	**Examination**
Week 9	**Nucleation kinetics, Heterogeneous nucleation**
Week 10	**Nucleation Rate and The growth**
Week 11	**Physical properties of materials (mechanical properties, true stress-strain curve, shear stress and strain, poisons ratio.**
Week 12	**Hardness ,Toughness , Types of fructures**
Week 13	**Experimental techniques for material analysis, DTA, DSC DMS**
Week 14	**EDS ,electron microscopeAFM ,SEM**
Week 15	**Preparatory Week Before The Final Exam**
Week 16	

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	**Acquaint students with the knowledge of laboratory materials and devices used in the laboratory, and how to write reports after conducting experiments**
Week 2	**Structural properties (EDX)**
Week 3	**Surface properties (FESEM, TEM)**
Week 4	**Optical properties (UV, RAMAN)**
Week 5	**Physical Properties (Thermal Conductivity)**
Week 6	**Corrosion and absorption**
Week 7	**Mechanical Properties, Tensile Strength, and Stress–Strain Diagram Measurement**
Week 8	**Hardness Testing (Vickers, Rockwell, Brinell,…..)**
Week 9	**Compressive Test of Metal**
Week 10	**Review of Previous Experiments**
Week 11	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**1-Introduction to Solid State Physics BY** Charles Kittel **2- solid state physics** **3-علم المواد د. متي ناصر مقاديسي**	Yes
Recommended Texts	**Materials Science and Engineering An Introduction**	No
Websites	https://mrcet.com/downloads/digital_notes/ME/II%20year/MATERIAL%20SCIENCE.pdf	

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.

Third Stage
Medical Physics

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Quantum Mechanics			**Module Delivery**	
Module Type	**Core learning activity**			☐ ☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	PHY-324				
ECTS Credits	4:00				
SWL (hr/sem)	100				
Module Level	**UGIII**		**Semester of Delivery**		**6**
Administering Department	Physics/ Medical Physics		**College**	Science	
Module Leader	Oday Jawad Kadhim		**e-mail**	Oday.kadhim@uowasit.edu.iq	
Module Leader's Acad. Title	Asst.Prof.		**Module Leader's Qualification**		Ph.D
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	1-2-2026		**Version Number**		1

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	It is desired to identify the physical laws and its rule on Quantum mechanics phenomena and life. Solved problems will cover the applications of physics system. Analysis and communication: Real Physical systems are extremely complex and rarely well-defined. Making Reasonable assumptions and identifying models is the key to progress.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	Objectives: The course provides a general introduction to the physics of Quantum mechanics systems. Contents: The course introduces the fundamental concepts of Quantum phenomena. We will attempt to identify the reasons for using quantum mechanics that has the credited for move up the development of most branches of modern physics.
Indicative Contents المحتويات الإرشادية	A-Knowledge: Lectures will provide a basic understanding of the key concepts of physics by applying physical principles, methods and techniques. B-Cognitive Skills It is desired to identify the physical laws and its rule on Quantum mechanics phenomena. Solved problems will cover the applications of physics. C- Interpersonal skills and responsibilities Students will be encouraged to attempt the problems independently and then collaborate and solve together. D- Analysis and communication: physics systems are extremely complex and rarely well-defined. Making reasonable assumptions and identifying models is the key to progress.

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 critical thinking skills. This will be achieved through classes, interactive tutorials and by considering the types of simple experiments involving some interesting sampling activities for the students.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
As		**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 /	1	10% (10)	Continuous	All
	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%		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري	
Week	**Material Covered**
Week 1	Physical Foundations of Quantum Mechanics
Week 2	Elementary Properties of Quantum Mechanics
Week 3	Derivation of Schrödinger wave equations
Week 4	Operators
Week 5	Eigen value equation
Week 6	Simplified quantum systems
Week 7	Density of states
Week 8	Simple Harmonic Oscillator
Week 9	Operator treatment (energy eigen values and eigen wave functions)
Week 10	One-electron atoms
Week 11	Hydrogen atom
Week 12	Angular momentum Spin angular momentum
Week 13	Correction Methods
Week 14	Time Independent Non-Degenerate Perturbation Theory
Week 15	Applications
Week 16	Final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**1) Text Book:** الميكانيك الكمي/ جاسم الحسيني وعبد السلام عبد الامير/1981 **2) Auxiliary Books** **a)** ميكانيكا الكم/محمد نبيل يس البكري وصلاح الدين يس البكري/2014 **b)** اساسيات ميكانيك الكم/ سالم حسن الشماع، أمجد عبد الرزاق	

	1988/كريجه **c)** 1985/مقدمة في ميكانيك الكم/هاشم عبود، ضياء **d)** المبادئ الفيزيائية لنظرية الكم/فيرنر هايزنبيرج، ترجمة محمد صبري عبد المطلب وانتصار محمد الشبكي، 2016. **e)** Introduction to Quantum Mechanics\Matthews\1984. **f)** Making sense of quantum mechanics\Jean Bricmont, 2016.	
Recommended Texts	**Lectures on Quantum Mechanics** **(An Introduction) 2024**	
Google classroom	• https://classroom.google.com/c/NzkzNTMzNjg3NTUz?cjc=3impmtrl	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Laser in Medicine**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-325**				
ECTS Credits	4				
SWL (hr/sem)	**100**				
Module Level	**UGIII**		**Semester of Delivery**	6	
Administering Department	Physics/ Medical Physics		**College**	Sciences	
Module Leader	Hanan Abd Ali Thjeel		**e-mail**	halukely@uowasit.edu.iq	
Module Leader's Acad. Title	Asst.Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	08/02/2026		**Version Number**	1.0	

Relation with other Modules العالقة 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 اهداف المادة الدراسية	1. This course makes the student able to use the lens and mirrors and all tools used in optics 2. to understand the behaviour and properties of light, including its generation, manipulation, and interaction with matter 3. This knowledge is crucial for developing technologies like lasers and optical instruments (telescopes, microscopes, cameras), as well as for understanding natural phenomena such as rainbows and the workings of the human eye 4. The main goal of optics is to develop theories, models, and techniques that allow us to manipulate and control light for practical purposes, such as imaging, communication, and sensing.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Recognise why Medical professionals study laser tissue interaction—such as ablation, vaporization, and coagulation—to optimize treatments in specialized areas like dermatology, oncology, and ophthalmology 2. Recognise the types of lasers in medicine 3. Discuss principles of laser 4. to understand properties of laser and application it 5. Know the basics of theory in lasers and their uses in medical applications 6. Focus on applications of lasers in the medical field
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Part B – application

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. The main strategy for delivering this module is to encourage student's participation in the exercises while refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and simple experiments involving interesting sampling activities for the students. 2. Make the student able to use lasers and all tools used in the medical field 3. The student should be able to have more information about how lasers are used for diagnostic imaging, removing precancerous tumors, breaking up kidney stones, and in therapeutic applications like low-level laser therapy (photobiomodulation) for pain management and wound healing.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**52**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	8	All
	Assignments	1	10% (10)	3	all
	Activates	1	10% (10)	4	all
	Report	1	20% (10)	13	all
Summative assessment	Midterm Exam	2 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Historical perspective
Week 2	Types of lasers
Week 3	Lasers compared with conventional light sources
Week 4	. Models of laser–tissue interactions
Week 5	Exposures and exposure rates
Week 6	The electromechanical (photomechanical or photo-disruptive) mode
Week 7	Midterm Exam
Week 8	Ablation
Week 9	Photothermal (coagulative and vaporizing) processes
Week 10	Photochemical (photodynamic) reactions
Week 11	Biostimulation and wound healing
Week 12	Practical considerations of lasers in medicine
Week 13	Factors influencing laser choice
Week 14	Laser delivery systems
Week 15	Laser safety and Therapeutic applications of lasers (Lasers in dermatology Lasers in ophthalmology, Lasers in dentistry Lasers in otolaryngology, and the diagnostic applications of lasers
Week 16	Preparatory Week Before The Final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Lasers in Medicine**	**No**
Recommended Texts	**Text of the book on laser**	**No**
Websites	https://www.rp-photonics.com/laser_light.html	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Physics of Diagnostic Radiology I**			**Module Delivery**	
Module Type	**Core learning activity**			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☒Seminar	
Module Code	**PHY-313**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level	**UGIII**		**Semester of Delivery**	**5**	
Administering Department	**Physics/ Medical Physics**		**College**	**Science**	
Module Leader	**Dr. Manal Jabbar Khalifa**		**e-mail**	mjabbar@uowasit.edu.iq	
Module Leader's Acad. Title	**Asst.Prof.Dr**		**Module Leader's Qualification**	**Ph.D.**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	**1/ 6 /2025**		**Version Number**	**1.0**	

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 اهداف المادة الدراسية	1. To provide students with the fundamentals of diagnostic radiology physics. 2. To identify the components and physical principles of diagnostic X-ray equipment. 3. To understand the effects of imaging parameters on image quality. 4. To introduce CT and ultrasound imaging physics.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Understand atomic and nuclear structure. 2. Explain radioactive decay processes. 3. Distinguish ionizing from non-ionizing radiation. 4. Describe X-ray system components. 5. Explain X-ray generation and spectrum. 6. Understand X-ray interaction with tissues and image contrast. 7. Interpret basic CT and ultrasound physics.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Atomic and nuclear structure, nuclear stability, radioactive decay [6 hrs] Electromagnetic radiation: ionizing vs non-ionizing [4 hrs] X-ray production and equipment components [8 hrs] Factors affecting X-ray spectrum and interaction with tissues [6 hrs] CT principles, Hounsfield units, image acquisition [6 hrs] Ultrasound wave generation and characteristics [6 hrs] Final revision and exam [4 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Use of lectures, presentations, and active discussions. Problem-solving sessions and student-led seminars. Encouraging self-learning and use of imaging resources.

Student Workload (SWL) الحمل الدراسي للطالب محسوب ل 15 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**52**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes+ Homework**	2	20% (20)	3,6,9, 11	LO :1, 2,3 , 4 5,6,7,and 8
	Seminars	2	10% (10)	3,4,,6,8, 11	LO :3, 9, 10, 11 and 12
	Projects / Lab.	0	/	/	/
	Reports	2	10% (10)	6,13	LO : 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO : 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Radiology Physics
Week 2	Atomic/Nuclear Structure
Week 3	Nuclear Stability & Decay
Week 4	Radiation Types
Week 5	X-ray Equipment
Week 6	X-ray Production +Seminar – Radiation Types Discussion
Week 7	X-ray Spectrum & Interaction

Week 8	Exam 1
Week 9	CT Introduction
Week 10	CT Imaging + Hounsfield Units + Seminar
Week 11	Ultrasound Physics+ Seminar
Week 12	Image Contrast Review +Seminar & Review
Week 13	Quiz + Final Review
Week 14	Exam2
Week 15	**Preparatory Week**
Week 16	**The Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Diagnostic Radiology Physics: A Handbook for Teachers and Students by D.R. Dance et al.	No (Available Online)
Recommended Texts	-Handbook of MRI Technique - MRI Physics	No (Available Online)
Websites	- https://radiopaedia.org - https://www.mriquestions.com	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Anatomy**			**Module Delivery**	
Module Type	**Core learning activity**			☐ ☒ **Theory** ☐ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**PHY-311**				
ECTS Credits	**6:00**				
SWL (hr/sem)	**150**				
Module Level		**UGIII**	**Semester of Delivery**		**6**
Administering Department		**Physics/ Medical Physics**	**College**	**Science**	
Module Leader	Ahmad Mahdi Salih		**e-mail**	aalmyahi@uowasit.edu.iq	
Module Leader's Acad. Title		professor	**Module Leader's Qualification**		Ph.D
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		1-6-2025	**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	▪ The primary objective from this course is to provide a thorough background in the human body structure. ▪ The aim of anatomy is to describe & explain the systems in the body and its functions. ▪ Identifying the shape of the body parts and determining their exact locations with the help of illustrations and films. ▪ Students are qualified to complete their postgraduate studies inside and outside the country. ▪ Students acquire a reasonable level of body morphology knowledge that is consistent with what is known among the various universities of the world.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	▪ Training students on how to identify the main types of the anatomy by focusing on medically relevant topics. ▪ Providing them with sufficient information to enable them to understand the movement and different functions taking place in the human body at the anatomical level. ▪ Explaining the the chief methods for study the anatomy ▪ Descriptive all the anatomical terms that used in the medical application
Indicative Contents المحتويات الإرشادية	▪ Anatomy is the branch of biological sciences which describes the shape, structure, location, of the organs and systems in the body. ▪ Anatomy describes the relation of each organ with others. ▪ Anatomy means the cutting or dissections of parts of the body.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The chief strategy that will be dependent in delivering this unit is presentation and conversation meetings with the participation of students in describing the shape, structure, location, of the organs and systems in the body, while at the same time refining and growing their skills. This will be reached through classes, interactive discussion groups, and participation in laboratory experiments.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ 14 اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**78**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
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

As		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	4,9	All
	Assignments	2	10% (10)	3,10	All
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	12	All
Summative assessment	Midterm Exam	2 hr	10% (10)	8	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	introduction, and the main types of the anatomy
Week 2	The chief methods for study the anatomy, Anatomical planes
Week 3	Descriptive anatomical terms, Body Cavitie
Week 4	Osteology, The description of the skeleton (bones and cartilage), Bones of the Axial Skeleton

Week 5	Bones of appendicular skeleton
Week 6	Joints, Classification of joints
Week 7	1st mid examination
Week 8	The gastrointestinal tract .
Week 9	Respiratory system, Upper Respiratory Tract
Week 10	Lower Respiratory Tract
Week 11	Urinary System
Week 12	Male genetal system
Week 13	Femal genetal system
Week 14	2ed mid examination

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	Introduction, Anatomical planes
Week 2	Sections in anatomical terms, sections in body cavitie
Week 3	Samples of the Axial Skeleton, skell and vertebral column
Week 4	Samples of the of appendicular skeleton, ribs and upper limb
Week 5	Sample of upper limb
Week 6	Sample of joints
Week 7	Angular movements of joints
Week 8	1st mid examination
Week 9	Samples of nasal cavity, phyrenx and larynex
Week 10	Samples of trachea, bronchi and lungs
Week 11	Samples of kidney, ureter and urinary bladder

Week 12	Samples of uterus, overy and oviduct
Week 13	Samples of testes, urethra, prostst gland
Week 14	2nd mid examination

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Atlas of Human Anatomy, 7th Edition, 2017**	
Recommended Texts	**Basic Human Anatomy**	
Websites	**https://repository.poltekkes kaltim.ac.id/1144/1/Essentials%20of%20Anatomy%20and%20Physiology%20(%20PDFDrive%20).pdf**	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Spectra معلومات المادة الدراسية					
Module Title	**Spectra**			**Module Delivery**	
Module Type	**Elective learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-316**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**UGIII**	**Semester of Delivery**		**5**
Administering Department		**Physics/ Medical Physics**	**College**	**Sciences**	
Module Leader	Ali Karrim Aboud Mohammed		**e-mail**	ahatab@uowasit.edu.iq	
Module Leader's Acad. Title		Lecture			Ph.D.
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		01/09/2025	**Version Number**		1.0

Relation with other Modules العالقة 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 اهداف المادة الدراسية	1. Providing learners with knowledge of the principles of atomic spectra. 2. Developing positive attitudes toward atomic spectra. 3. Learn about research methods in atomic spectra. 4. Learn the basic concepts in atomic spectra. 5. Identify the basic trends in atomic spectra 6. Identify the objectives of atomic spectra 7. Develop learners' knowledge of the historical development of the concept of atomic spectra 8. Identify the components of the basic properties of atomic spectra 9. Identify the basic information of atomic models 10. Gain theoretical knowledge of continuous and line spectra 11. Identify absorption and emission spectra 12. Evaluate the performance of continuous X-ray spectra 13. Gain skills in atomic spectroscopy instruments
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Knowledge of Modern atomic model theory 2. Knowledge of Bohr's model and hydrogen atom 3. Knowledge of Atomic transition series 4. Knowledge of Hydrogen atom spectrum 5. Knowledge of Introduction to atomic and molecular spectra 6. Knowledge of Divisions and properties of the electromagnetic spectrum 7. Knowledge of Continuous spectrum and line spectrum 8. Knowledge of Absorption spectrum and emission spectrum 9. Knowledge of Hydrogen atom spectrum and Rydberg constant 10. Knowledge of Infrared spectrum 11. Knowledge of Infrared absorption mechanism 12. Knowledge of X-ray spectrum 13. Knowledge of Visible spectrum and ultraviolet spectrum 14. Knowledge of Basic components of spectroscopic devices 15. Knowledge of Absorption devices, emission devices, and scattering measurement devices
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Part B – application

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The initial strategy adopts a step-by-step approach, starting with basic electromagnetic radiation principles and progressing to complex spectral phenomena, progressing from simple atomic spectra to complex molecular systems.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**52**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	2	20% (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	Atomic Models Modern Atomic Model Theory
Week 2	Bohr's model and hydrogen atom
Week 3	Atomic transition series
Week 4	Hydrogen atom spectrum
Week 5	Introduction to atomic and molecular spectra
Week 6	Divisions and properties of the electromagnetic spectrum
Week 7	Continuous spectrum and line spectrum
Week 8	Absorption spectrum and emission spectrum
Week 9	Hydrogen atom spectrum and Rydberg constant
Week 10	Infrared spectrum
Week 11	Infrared absorption mechanism

Week 12	X-ray spectrum
Week 13	Visible spectrum and ultraviolet spectrum
Week 14	Basic components of spectroscopic devices
Week 15	Absorption devices, emission devices, and scattering measurement devices
Week 16	**Preparatory Week Before The Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	• Pavia, D. L., Lampman, G. M., Kriz, G. S., & Vyvyan, J. A. (2015). Introduction to Spectroscopy, 5th Edition. Cengage Learning. • Hollas, J. M. (2023). Modern Spectroscopy, 4th Edition. Wiley-Blackwell.	No
Recommended Texts	• Atomic Spectra and Atomic Structure, by G. Herzberg, 1984 • Hollas, J.M. "Modern Spectroscopy" (2023)	No
Websites	https://www.nist.gov/pml/atomic-spectra-database	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	**Physics of living systems**	**Module Delivery**	
Module Type	**Elective learning activity**	☒ **Theory** ☐ **Lecture** ☐ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-326**		
ECTS Credits	**4**		
SWL (hr/sem)	**100**		
Module Level	**UGIII**	**Semester of Delivery**	**6**
Administering Department	Physics/Medical Physics	**College**	Sciences
Module Leader	Zainab Ali	**e-mail**	zainabali@uowasit.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor		**e-mail**	zainabali@uowasit.edu.iq
Peer Reviewer Name		**e-mail**	
Scientific Committee ApprovalDate	01/06/2025	**Version Number**	1.0

Relation with other Modules

العالقة 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 اهداف المادة الدراسية	1-It is explained that all types of living systems are subject to the laws of physics 2- The lectures focus on the fundamental behavior of ions, proteins, membranes, and biological systems. 3-To enable students to identify physical laws and their effects on biological phenomena and our lives. 4- To enable students to use this information in their future careers, as well as in scientific research and practical experiments, thus contributing to serving the community and developing the educational landscape.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	**1. Knowledge and Understanding** • Explain the concept of **living systems** from a physical perspective and distinguish them from non-living systems. • Describe the role of fundamental physical laws (energy, thermodynamics, mechanics, and transport phenomena) in biological systems. • Identify the physical principles governing the behavior of cells, tissues, and organs. • Explain key concepts such as diffusion, fluid flow, elasticity, and self-regulation in living systems. **2. Cognitive Skills** • Analyze the behavior of living systems using simplified physical models. • Compare living and non-living systems in terms of organization, energy consumption, and response to environmental stimuli. • Interpret biological phenomena using appropriate physical laws and mathematical relations. **3. Practical and Analytical Skills** • Apply mathematical and physical tools to solve problems related to living systems. • Use concepts such as Reynolds number, thermal diffusion, and mass transport in biological contexts. • Perform basic physical calculations related to biological processes such as blood flow and ion transport across membranes. **4. Communication and Teamwork Skills** • Communicate concepts of biophysics clearly in written and oral scientific form. • Work effectively in teams to discuss interdisciplinary problems involving physics and biology. **5. Professional Values and Attitudes**

	• Appreciate the importance of physics in understanding complex biological systems. • Demonstrate scientific thinking and critical analysis. • Show responsibility and professionalism in scientific work.
Indicative Contents المحتويات الارشادية	Indicative content includes the following. 1. Introduction to Physics of Living Systems 2. Fundamental Concepts in Biophysics 3. Thermodynamics of Living Systems 4. transport and Diffusion in Living Systems 5. Fluid Flow and Biomechanics 6. Elasticity and Mechanical Properties of Biological Tissues

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Interactive Lectures 2. Problem-Based Learning (PBL) 3. Project-Based Learning 4. Cooperative Learning 5. Inquiry-Based Learning 6. Laboratory-Based Learning 7. Technology-Enhanced Learning 8. Self-Directed Learning 9. Discussions and Student Presentations 10. Context-Based Learning

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**52**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	1	20% (10)	13	All
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	General Concepts
Week 2	Thermodynamics and Energy
Week 3	Transport and Diffusion
Week 4	Fluid Flow and Biomechanics
Week 5	Elasticity and Mechanical Properties
Week 6	Electricity and Neurophysics
Week 7	Midterm Exam
Week 8	Dynamics and Nonlinear Systems
Week 9	Biological Networks and Complexity
Week 10	Contemporary Applications
Week 11	Surface and Interfacial Tensions
Week 12	Introductory Concepts of Nervous Systems
Week 13	Biomechanics of Human Body
Week 14	Biological Properties of Skeleton
Week 15	Optics of the Eye
Week 16	**Preparatory Week Before the Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	"Biophysics: An Introduction" – Rodney Cotterill Physical Biology of the Cell" – Rob Phillips, Jane Kondev, Julie Theriot, Hernan Garcia "Molecular and Cellular Biophysics" – Meyer B. Jackson	No
Recommended Texts	Molecular and Biological Physics of Living Systems by R. Mishra, Academic Press.(2005) "Biophysics" – Patricia Bassereau, Hervé Lévy "Introduction to Biomechanics" – Nihat Özkaya, Margareta Nordin	No
Websites	Resources specializing in the subject of physics of living systems	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Radiation Protection**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☐ **Lab** ☐ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**PHY-315**				
ECTS Credits	**4**				
SWL (hr/sem)	**100**				
Module Level		**UGIII**	**Semester of Delivery**		**5**
Administering Department		Physics/Medical Physcis	**College**	Sciences	
Module Leader	Saba Farhan Hathot		**e-mail**	saaldaher@uowasit.edu.iq	
Module Leader's Acad. Title		Assist. Prof	**Module Leader's Qualification**		Ph.D.
Module Tutor			**e-mail**	saaldaher@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate		**1-6-2025**	**Version Number**	**1.0**	

Relation with other Modules العالقة 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 اهداف المادة الدراسية	1. Providing students with basic scientific knowledge • Understanding the nature of ionizing radiation and its natural and artificial sources. • Studying the effects of radiation on matter and biological systems. 2. Enhancing prevention skills and safe procedures • Applying radiation protection principles in accordance with international standards and legislation. • Developing the ability to use radiation dose measuring and monitoring devices. 3. Preparing students to work safely in radioactive environments • Enabling students to assess radiation risks and develop strategies to reduce exposure. • Training them in the use of protection techniques such as shielding, time spacing, and dose reduction. 4. Promoting scientific research and innovation in the field of radiation protection • Encouraging students to develop innovative radiation protection solutions. • Supporting research into radiation protection applications in medicine, industry, and the environment.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Understanding the basics of ionizing radiation 2. Applying the principles of radiation protection 3. Using radiation measuring and monitoring devices 4. Analyzing the biological effects of radiation 5. Implementing international regulations and legislation 6. Designing and implementing radiation emergency plans 7. Using radiation protection methods and techniques 8. Assessing and managing radiation risks 9. Active participation in scientific research and development
Indicative Contents المحتويات الارشادية	1. Theoretical Foundations of Radiation: This course covers the basic concepts of radiation, its types, sources, interactions with matter, and biological effects, in addition to defining doses and their units. 2. Measurement and Detection Techniques: This course covers types of radiation detection devices, measurement and calibration methods, and methods for determining radiation levels in the environment and samples. 3. Protection Principles and Applications: This course focuses on protection strategies (time, distance, shielding), international laws, radioactive waste management, and applications in medical and industrial fields.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	The Radiation Protection course relies on an integrated blend of active learning and interactive teaching methods. The strategy includes theoretical lectures to introduce the scientific foundations and basic concepts related to radiation, its sources, and its effects, along with the implementation of small projects that enable students to acquire practical skills in measuring radiation, assessing radiation levels, and means of protection. It also relies on problem-based learning (PBL) and the analysis of real-life case studies to enhance applied understanding and develop critical thinking. Self-directed and research-based learning is encouraged through individual and group assignments.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**3.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**52**	**Unstructured SWL (h/w)** ال الحمل الدراسي غير المنتظم للطالب أسبوعيا	**3.47**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments &H. W	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	seminar	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered

Week 1	Introduction to radiation physics and Atomic Structure
Week 2	Types of ionizing and non-ionizing radiation and their properties.
Week 3	Sources of Radiation: natural and artificial.
Week 4	The interaction between radiation and matter.
Week 5	Radioactive Decay and Gamma-Ray Emission.
Week 6	X-Ray and, the Production of X-Rays
Week 7	Midterm Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

Week 8	Biological effects of radiation on cells and tissues and Medical Radiation Sources
Week 9	Radiation detectors, analytical methods for measuring radioactivity in various samples.
Week 10	Radiation doses (absorbed, effective, equivalent) and their units. Comparison of Radiation Doses
Week 11	Principles of Radiation Protections
Week 12	Methods for maximizing distance from sources of radiation
Week 13	Basic principles of radiation protection: Proper uses of shielding
Week 14	Practical applications of radiation protection in medicine, industry, and scientific research.
Week 15	Applications of radiation
Week 16	**Preparatory Week Before the Final Exam**

	Text	**Available in the Library?**
Required Texts	***-Sherer, M. A. S., Visconti, P. J., Ritenour, E. R., & Haynes, K. (2021). Radiation protection in medical radiography. Elsevier Health Sciences.*** ***-Bushong, S. C., & Goerner, F. (2012). Radiology science for technologists. Elsevier Health Sciences.***	No
Recommended Texts	***-Limbacher, M., Douglas, P. S., & Germano, G. (1998). Radiation safety in the practice of cardiology. Journal of the American College of Cardiology, 31(4), 892-915.***	No
Websites		

Grading Scheme

مخطط الدرجات

Group	**Grade**	التقدير	**Marks (%)**	**Definition**
	A - Excellent	امتياز	90 - 100	Outstanding Performance

Success Group (50 - 100)	**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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Optics (geometrical and optical)**			**Module Delivery**	
Module Type	Core learning activity **Core learning activity**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-314**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**UGIII**		**Semester of Delivery**	**5**	
Administering Department	Physics/Medical Physcis		**College**	Sciences	
Module Leader	Hanan Abd Ali Thjeel		**e-mail**	halukely@uowasit.edu.iq	
Module Leader's Acad. Title	Assistant Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	01/06/2025		**Version Number**	1.0	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	NONE	**Semester**	
Co-requisites module	Lab of optics	**Semester**	5

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	11. This course makes the student able to use the lens and mirrors and all tools used in optics 12. to understand the behaviour and properties of light, including its generation, manipulation, and interaction with matter 13. This knowledge is crucial for developing technologies like lasers and optical instruments (telescopes, microscopes, cameras), as well as for understanding natural phenomena such as rainbows and the workings of the human eye 14. The main goal of optics is to develop theories, models, and techniques that allow us to manipulate and control light for practical purposes, such as imaging, communication, and sensing.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	16. Recognize the geometrical and physical optics 17. Recognise the types of mirrors and lenses 18. Discuss principles of optics 19. to understand coherence, interference and application it 20. Know the basics of theory in optics 21. Focus on applications of optics in the medical field
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Part B – application

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. The main strategy for delivering this module is to encourage student's participation in the exercises while refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials, and simple experiments involving interesting sampling activities for the students. 2. Make the student able to use the lens and mirrors and all tools that used in optics 3. The student should be able to have more formation about optics (geometrical and physical)

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**78**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**72**	**Unstructured SWL (h/w)** ال 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**	1	10% (10)	8	All
	Assignments	1	10% (10)	3	all
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	20% (10)	13	all
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Nature of Light
Week 2	Optical Path
Week 3	The Critical Angle And Total Reflection
Week 4	Spherical Surfaces
Week 5	Graphical Constructions
Week 6	Thin Lenses
Week 7	Midterm Exam

Week 8	lateral magnification
Week 9	One-dimensional wave equation
Week 10	The Superposition of Waves
Week 11	Huygens' Principle, Interference of light
Week 12	Young's Double-Slit Exp., Fresnel Exp.
Week 13	Interference in dielectric films., Newton ring Exp.
Week 14	Michelson interferometer, Fabry-Perot interferometer]
Week 15	Applications of Michelson interferometer
Week 16	**Preparatory Week Before The Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Study the characteristics of the image formed by a convex lens and find the focal length
Week 2	Study the characteristics of the image formed by the concave mirror and find the focal length
Week 3	Using a moving microscope to measure the refractive index of glass and water
Week 4	Use the spectrometer to calculate the refractive index of a transparent material
Week 5	Use the spectrometer to find the diffraction grating constant
Week 6	Newton 's Rings
Week 7	Find the dispersive and resolving power of the prism
Week 8	Study the relationship between intensity and the radius of curvature of an optical fiber
Week 9	Review of previous experiments
Week 10	Final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Introduction to modern optics	Yes
Recommended Texts	Text of book on optics	No
Websites	https://chineselens.com/ar/cylindrical-lenses/ https://www.wolframalpha.com/	

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

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MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Physiology**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☐ **Lecture** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	PHY-321				
ECTS Credits	**6.00**				
SWL (hr/sem)	**150**				
Module Level	**UGIII**		**Semester of Delivery**		**6**
Administering Department	Physics/Medical Physcis		**College**	Sciences	
Module Leader	**Dr. Jafar Abbas Issa al-Maamori**		**e-mail**		
Module Leader's Acad. Title	**Professor**		**Module Leader's Qualification**		**Ph.D.**
Module Tutor			**e-mail**	jalmaamori@uowasit.edu.iq	
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	1-2-2026		**Version Number**	1.0	

Relation with other Modules العالقة 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 اهداف المادة الدراسية	Providing students with scientific concepts in the fields of fundamentals of physiology and its applications as follows: 1. Teaching students and introducing them to the physiology principles and the functions of some major physiological body systems and their role in maintaining the body's internal homeostasis. 2. An understanding of the special mechanisms used to transport selected molecules that cannot cross the plasma membrane at functional cellular level for biological system. 3. Study human physiology as a model for physiological processes in other organisms. 4. Further develop the practical biological skills introduced in this physiology course. 5. Basic knowledge of performing, analyzing, and reporting experiments and observations in physiology.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	Generally: 1. Provide a comprehensive understanding of how the human body functions, focusing on homeostatic regulation from cellular to systemic levels. Key outcomes include explaining mechanisms of major organ systems (cardiovascular, nervous, respiratory, renal, endocrine), analyzing clinical scenarios, and developing skills to perform and report on laboratory. 2. As well as with each new section and chapter, we will be able to appreciate the key relationship between **structure** (anatomy) and **function** (physiology) of the body, and the inextricable connection between them.
Indicative Contents المحتويات الارشادية	Refers to the physical and chemical processes enabling life, focusing on homeostasis, cell function, and the coordination of all organ systems. Key areas include the nervous, endocrine, cardiovascular, respiratory, digestive, muscular, and renal systems. It explores metabolism, growth, immunity, and reproduction to maintain a stable internal environment.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. **Lectures:** In traditional lecture-based courses, teachers deliver content to students through oral presentations. This format is often supported by slides, multimedia, or aids to enhance understanding. 2. **Self-learning**: Contributes to the acquisition of specialized knowledge and promotes self-motivation. 3. **Examinations:** Examinations demonstrate the achievement of an appropriate level of specialized knowledge in physiology, with an emphasis on understanding and communication (essay and problem-solving questions) or recall of factual knowledge (multiple-choice or short-answer tests). 4. **Practical exercises:** Allow students to use knowledge gained from lectures and support the development of key skills in practice 5. Using modern educational technology :As supportive teaching methods

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**78**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**72**	**Unstructured SWL (h/w)** لحمل الدراسي غير المنتظم للطالب أسبوعيا	**4.8**
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	8, 12	LO #1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	2, 12	LO # 9, 10, 11 and 12
	Projects / Lab.	0	0% (10)	Continuous	All
	Report	1	20% (10)	13	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to physiology and its general principles
Week 2	Cell structure and physiology
Week 3	Exchange through cell membrane
Week 4	Physiology of Cardiovascular system (circulatory system); Excitation and transmission of heartbeat
Week 5	Nervous system physiology
Week 6	First Exam.
Week 7	Urinary physiology regulation and exchange between body fluids.

Week 8	The acid-base balance of the body
Week 9	Muscular system physiology
Week 10	Respiratory system physiology
Week 11	Digestive system Physiology (Digestion and absorption)
Week 12	Endocrine system; types of endocrine glands.
Week 13	The pituitary and thyroid glands
Week 14	Male and Female reproductive systems
Week 15	Second exam.
Week 16	**Final Exam**

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

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1. Al-Aluji, Sabah Nasser. **Physiology**, University of Baghdad (2014). 2. Kamari, Ahmed. **Introduction To Human Physiology and Anatomy**. University of Aleppo Publications (2007). 3. Rye, C.; Wise, R.; Desaix, J.; Choi, J and Avissar, Y. **Biology**. Rice University (2017).	Non
Recommended Texts	Physiology periodicals issued by Elsevier Publishing	
Websites	https://www.physiology.org/career/teaching-learning-resources/student-resources/what-is-physiology?SSO=Y	

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Medical Physics I**			**Module Delivery**	
Module Type	**Core learning activity**			☒ Theory ☐ Lecture ☒Lab ☐ Tutorial ☐ Practical ☒Seminar	
Module Code	**PHY-312**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIII**	**Semester of Delivery**		**5**
Administering Department		**Physics/ Medical Physics**	**College**	**Science**	
Module Leader	**Zeina Abbass Salman**		**e-mail**	**zsalman@uowasit.edu.iq**	
Module Leader's Acad. Title		**Lecturer**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor	**NA**		**e-mail**	**NA**	
Peer Reviewer Name		**NA**	**e-mail**	**NA**	
Scientific Committee ApprovalDate		**01/06/2023**	**Version Number**	**1.0**	

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**Medical Physics Lab I**	**Semester**	**5**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	15. Emphasis on acquiring advanced knowledge about physical applications in medicine such as the interaction between radiation and living tissues. 16. Focus in the lectures on linking and applying physical principles to medical fields in diagnosis and treatment. 17. Enable students to understand how medical devices work and how to use them. 18. Explain that the physical techniques are the way to develop medical diagnosis and treatment, which helps improve health care. 19. Enable students to use the provided information in their future fields of work as well as the fields of scientific research and practical experiments in a way that contributes to serving society and developing the reality of education in it.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	22. Provide the students with an introduction about the principles of medical physics and the measurement techniques 23. Help students understand the relationship between the electric field, Ohm's law, and methods of measuring the electricity of brain and heart 24. Introduce visible light and its importance in medical fields and discuss the applications of visible light in medical equipment such as endoscope 25. Explain the structure of eye, the vision defects, and the available approaches to correct them 26. Enable students to determine the causes of eye pressure and the way of measuring it 27. Introduce the difference between the force on and by the body as well as the laws of the static equilibrium, elasticity in motion, and their importance in medical applications 28. Explain the laws of forces and static equilibrium using different examples of levers in the body 29. Define energy and its types, work, and power logarithmic functions 30. Identify the methods of transferring energy into and out of the body 31. Discuss the definitions of energy, work, and power of the human and their importance in medical physics
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Medical Physics Fields, Electricity, Light and Optics, The structure of eye and the vision defects, Pressure in the Eye [16 hrs] Force and Laws of Motion, Forces on and by the Body, Forces on and by the Body, Ways to Transfer Energy into or out of the Body, Definitions of energy, work, and power of the body [16 hrs] Levers System in the Body, Energy, Work, and Power, Energy, Work, and Power of the Body [8 hrs] Part B – application Application of Physics in Medicine and Measurements, Methods of measuring the electricity of brain and heart, Visible light in Medical Applications-Endoscope, The available approaches to correct the vision defects, The causes of eye pressure and the way of measuring it [16 hrs] Introducing the difference between the force on and by the body, Definitions of energy and its types, word, and power[16 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	•Using presentation, participation, problem solving, and discussion. •Using modern technology for education and encouraging students to participate in group discussions. •Encouraging students to self-learn and form groups to discuss scientific material.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**78**	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**72**	**Unstructured SWL (h/w)** **ال 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)	3, 9	1, 2,3 , 4 5,6,7,and 8
	Assignments	2	10% (10)	8, 13	9, 10, 11 and 12
	Laboratory	1	10% (10)	Continuous	All
	Discussing during lectures	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Medical Physics
Week 2	Medical Physics Fields
Week 3	Application of Physics in Medicine and Measurements
Week 4	Electricity
Week 5	Light and Optics
Week 6	Visible light in Medical Applications-Endoscope

Week 7	Eye, Vision Defects, and their Correction Methods
Week 8	Pressure in the Eye
Week 9	Force and Laws of Motion
Week 10	Forces on and by the Body
Week 11	Laws of the Static Equilibrium, Elasticity in Motion, and their Importance in Medical Applications
Week 12	Examples of a Levers System in the Body
Week 13	Energy, Work, and Power
Week 14	Ways to Transfer Energy into or out of the Body
Week 15	Energy, Work, and Power of the Body
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	**Acquaint students with the knowledge of laboratory medical physcis and devices used in the laboratory, and how to write reports after conducting experiments**
Week 2	Understanding the Physics Behind an Otoscope
Week 3	Electricity in the Human Body
Week 4	Electrocardiogram (ECG) Signal Measurement and Analysis
Week 5	Measuring Electricity in the Human Brain (EEG)
Week 6	The Physics of Endoscopy
Week 7	Investigating Force and Motion in Muscle Contractions
Week 8	Exploring the Lever System in the Human Body
Week 9	Human Stair-Climb Power Test – Measuring Energy and Power in the Human Body
Week 10	**Review of Previous Experiments**
Week 11	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1) Medical physics, John R .Cameron, 1978. 2) Medical Physics, Hazem Sakeek, 2014.	No
Recommended Texts	1) Physics for Scientists and Engineers (with Physics NOW and InfoTrack) Raymond A. Serway and John W. Jewett, Thomson Brooks/Cole © 2004, 6th Edition. 2) Physics for Biology and Medicine, Paul Davidovits, Academic Press, Elsevier 2008, 3rd Edition.	No
Websites	1) Power point slides of Serway book (Physics for Scientists and Engineers) from Cengage Learning Company (http://www.cengage.com) 2) Dr. Taima lectures in medical physics, University of Mosul, 2016.	

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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Medical Physics II**			**Module Delivery**	
Module Type	**Core learning activity**			☒ Theory ☐ Lecture ☒Lab ☐ Tutorial ☐ Practical ☒Seminar	
Module Code	**PHY-322**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level		**UGIII**	**Semester of Delivery**		**6**
Administering Department		**Physics/Medical Physcics**	**College**	**Sciences**	
Module Leader	**Zeina Abbass Salman**		**e-mail**	**zsalman@uowasit.edu.iq**	
Module Leader's Acad. Title		**Lecturer**	**Module Leader's Qualification**		**Ph.D.**
Module Tutor	**NA**		**e-mail**	**NA**	
Peer Reviewer Name		**NA**	**e-mail**	**NA**	
Scientific Committee ApprovalDate		**01/02/2026**	**Version Number**		**1.0**

Relation with other Modules العالقة مع المواد الدراسية الأخرى			
Prerequisite module	**PHY-312**	**Semester**	**5**
Co-requisites module	**Medical Physics Lab II**	**Semester**	**6**

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. Emphasis on acquiring advanced knowledge about physical applications in medicine such as the interaction between radiation and living tissues. 2. Focus in the lectures on linking and applying physical principles to medical fields in diagnosis and treatment. 3. Enable students to understand how medical devices work and how to use them. 4. Explain that the physical techniques are the way to develop medical diagnosis and treatment, which helps improve health care. 5. Enable students to use the provided information in their future fields of work as well as the fields of scientific research and practical experiments in a way that contributes to serving society and developing the reality of education in it.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	1. Provide the students with an introduction about fluids and their laws 2. Help students understand the surface tension in medical fields and its importance for the living organisms 3. Introduce some applications of fluid dynamics in medical field and define pressure, blood pressure, and methods of measuring blood pressure 4. Explain temperature, heat, and thermal energy 5. Enable students of using the available methods of determining the emitted and absorbed energy by radiation such as Stefan-Boltzmann 6. Introduce sound waves and sound levels and their properties 7. Know the method of determining sound levels and using ultrasound in medical imaging and diagnosis 8. Determine the role of physics and its applications in cardiovascular system 9. Provide the principles of radiation protection when exposing to it as workers or sick people which improve the quality of society health system 10. Identify the nuclear medicine 11. Discuss some of the equipment used in nuclear medicine such as CT scan and PET
Indicative Contents المحتويات الارشادية	Indicative content includes the following. Part A - Fundamentals Definition of fluids and their laws, Surface Tension, Pressure and its Measurements, Temperature and Heat, Mechanics of Energy Transfer, Energy Absorption and Emission by Radiation, Definition of nuclear medicine [16 hrs] Sound Waves, Sound Levels, Ultrasound in Medical Diagnosis, Physics of Cardiovascular System, Radiation, Principles of Radiation Protection, Physics of Nuclear Medicine, CT Scan and PET [16 hrs] Definition of pressure, blood pressure, and methods of measuring blood pressure, Definitions of temperature, heat, and thermal energy, Methods of transferring the energy into and out of the body, Introducing the methods of determining the emitted and absorbed energy by radiation such as Stefan-Boltzmann [8 hrs] Part B – Application Applications of Fluid Dynamics, Applications of fluid dynamics in medical field, Sound waves and their properties, Method of determining sound levels, Using ultrasound in medical imaging and diagnosis [16 hrs] Physics and its applications in cardiovascular system, Definition of radiation, its types, and its importance in medical applications, Principles of radiation protection when exposing to it as workers or sick people which improve the quality of society health, Some equipment used in nuclear medicine such as CT scan and PET [16 hrs]

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	•Using presentation, participation, problem solving, and discussion. •Using modern technology for education and encouraging students to participate in group discussions. •Encouraging students to self-learn and form groups to discuss scientific material.

Student Workload (SWL)
الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	**78**	**Structured SWL (h/w)** **الحمل الدراسي المنتظم للطالب أسبوعيا**	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم للطالب خلال الفصل	**72**	**Unstructured SWL (h/w)** **ال 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)	3, 9	1, 2,3, 4, 5, 6, 7,and 8
	Assignments	2	10% (10)	8, 13	9, 10, 11 and 12
	Laboratory	1	10% (10)	Continuous	All
	Discussing during lectures	1	10% (10)	Continuous	All
Summative assessment	**Midterm Exam**	2 hrs	10% (10)	7	1-7
	Final Exam	3 hrs	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fluid Mechanics
Week 2	Surface Tension
Week 3	Pressure and its Measurements
Week 4	Applications of Fluid Dynamics
Week 5	Temperature and Heat

Week 6	Mechanics of Energy Transfer
Week 7	Energy Absorption and Emission by Radiation
Week 8	Sound Waves
Week 9	Sound Levels
Week 10	Ultrasound in Medical Diagnosis
Week 11	Physics of Cardiovascular System
Week 12	Radiation
Week 13	Principles of Radiation Protection
Week 14	Physics of Nuclear Medicine
Week 15	CT Scan and PET
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	**Acquaint students with the knowledge of laboratory medical physcis and devices used in the laboratory, and how to write reports after conducting experiments**
Week 2	Fluid Mechanics in the Human Body
Week 3	Measuring Ultrasonic Speed in Biological Tissues
Week 4	Ultrasound Beam Patterns Experiment
Week 5	Simulating Medical Thermography
Week 6	Investigation of the Cardiovascular System Using Doppler Ultrasound and Blood Pressure Measurement
Week 7	Half-Life measurement of a Radioactive Source
Week 8	Laser-Tissue Interaction in Medical Applications
Week 9	CT Dose Profile Analysis Using Thermoluminescent Dosimeters (TLDs) and Film
Week 10	**Review of Previous Experiments**
Week 11	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	1) Medical physics, John R .Cameron, 1978.	No

	2) Medical Physics, Hazem Sakeek, 2014.	
Recommended Texts	1) Physics for Scientists and Engineers (with Physics NOW and InfoTrack) Raymond A. Serway and John W. Jewett, Thomson Brooks/Cole © 2004, 6th Edition. 2) Physics for Biology and Medicine, Paul Davidovits, Academic Press, Elsevier 2008, 3rd Edition.	No
Websites	1) Power point slides of Serway book (Physics for Scientists and Engineers) from Cengage Learning Company (http://www.cengage.com) 2) Dr. Taima lectures in medical physics, University of Mosul, 2016.	

Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
Success Group (50 - 100)	**A** - Excellent	امتياز	90 - 100	Outstanding Performance
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	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.

MODULE DESCRIPTION

وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Diagnostic Radiology Physics II**			**Module Delivery**	
Module Type	**Core learning activity**			☒ **Theory** ☒**Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**PHY-323**				
ECTS Credits	**6**				
SWL (hr/sem)	**150**				
Module Level	**UGIII**		**Semester of Delivery**	**6**	
Administering Department	**Physics**		**College**	**Science**	
Module Leader	**Dr. Manal Jabbar Khalifa**		**e-mail**	mjabbar@uowasit.edu.iq	
Module Leader's Acad. Title	**Asst.Prof.Dr**		**Module Leader's Qualification**	**Ph.D.**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee ApprovalDate	**1 / 2 /2026**		**Version Number**	**1.0**	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PHY-313	**Semester**	**5**
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims اهداف المادة الدراسية	1. This course provides the fundamentals of diagnostic radiology physics and introduces the main components of diagnostic imaging devices through lectures and tutorials. 2. It covers the physical principles underlying each imaging modality, factors affecting image quality, and the main pulse sequences used in imaging. 3. The course emphasizes safety considerations, data acquisition mechanisms, and practical applications in medical imaging.
Module Learning Outcomes مخرجات التعلم المادة الدراسية	Upon successful completion of this module, students will be able to: 1. **Explain** the basic principles of MRI and nuclear medicine. 2. **Describe** the components and operation of MRI systems. 3. **Differentiate** between T1, T2, and PD imaging and their clinical uses. 4. **Analyze** factors affecting image contrast such as TR and TE. 5. **Recognize** safety considerations in MRI environments. 6. **Understand** radiation detection and imaging techniques in nuclear medicine (PET & SPECT). 7. **Interpret** basic medical images and apply problem-solving skills during tutorials.
Indicative Contents المحتويات الارشادية	Indicative content includes the following: Fundamentals of Magnetic Resonance: Introduction to nuclear magnetic resonance and its role in medical imaging. (2 hrs Lecture + 1 hr Tutorial) MRI System Components: Main components of MRI systems including magnet, gradient coils, RF system, and control unit. (2 + 1 hrs) Basics of MRI: Principles of image formation and signal acquisition in MRI. (2 + 1 hrs) Relaxation Mechanisms (T1 & T2): (2 + 1 hrs) Weighted Imaging in MRI: T1, T2, and proton density (PD) weighted imaging and clinical applications. (2 + 1 hrs) Tissue Contrast Control (TR & TE): Role of repetition time and echo time in contrast optimization. (2 + 1 hrs) MRI Safety: Safety principles, hazards, and patient protection in MRI environment. (2 + 1 hrs) Midterm Examination: First in-course exam. (2 hrs) Introduction to Nuclear Medicine Physics: Basic principles of nuclear medicine. (2 + 1 hrs) Nuclear Medicine Definition: Scope and applications in diagnosis and therapy. (2 + 1 hrs) Radiation Detection and Measurement: (2 + 1 hrs) Imaging Techniques in Nuclear Medicine: Methods of image acquisition in nuclear medicine. (2 + 1 hrs) PET and SPECT Imaging: Principles and clinical applications of PET and SPECT. (2 + 1 hrs) Final Examination / Second Exam: Second in-course or final exam. (2 hrs)

Learning and Teaching Strategies استراتيجيات التعلم والتعليم

Strategies	• Delivery of theoretical concepts through **lectures, presentations, and active discussions**. • **Problem-solving sessions** and **student-led tutorials** to enhance understanding. • Encouraging **self-directed learning** and effective use of imaging resources. • **Practical sessions in the laboratory** to develop hands-on skills.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب ل 15 اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	**5.2**
Unstructured SWL (h/sem) الحمل الدراسي الغير منتظم 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+ Homework**	2	15% (15)	3,6,9, 11	LO :1-8
	Tutorial	Continuous	10% (10)	3,4,,6,8, 11	LO :3, 9, 10, 11 and 12
	Lab.Quiz/practical exam	1	5%(5)	14	LO:5,8,10
	Lab Performance	Continuous	5%(5)	Throughout	LO : 5, 8, 10
	Lab.Reports	2	5% (5)	6,13	LO : 5, 8, 10
Summative assessment	**Midterm Exam**	2 hr	10% (10)	8	LO : 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fundamentals of Magnetic Resonance
Week 2	Main Components of an MRI Scanner
Week 3	Basics of MRI
Week 4	T1 &T2 in MRI

Week 5	T1, T2 and PD weighted imaging in MRI
Week 6	Main Tissue Contrast Controls(TR &TE)
Week 7	MRI Safety
Week 8	Exam 1
Week 9	Introduction to Nuclear Medicine Physics”
Week 10	Nuclear Medicine: Definition
Week 11	Radiation Detection and Measurement
Week 12	Imaging Techniques in Nuclear Medicine
Week 13	PET & SPECT scan
Week 14	Exam2
Week 15	**Preparatory Week**
Week 16	**The Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Diagnostic Radiology Physics: A Handbook for Teachers and Students by D.R. Dance et al.	No (Available Online)
Recommended Texts	-Handbook of MRI Technique - MRI Physics	No (Available Online)
Websites	- Radiopaedia - MRI Questions	

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.