Republic of Iraq
Ministry of Higher Education and Scientific Research
University of Wasit
College of Science – Department of Physics

ACADEMIC PROGRAM AND COURSE DESCRIPTION

Master of Science in Physics

Academic Year 2025–2026

1. Academic Program and Course Description Guide

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

Academic Program and Course Description Guide

Academic Year: 2025/2026

Concepts and terminology

1-1 Introduction

The academic program description is a short summary of the main features of the program and its courses . It shows what skills students are working to develop based on the program's goals . This description is very important because it is the main part of getting the program accredited , and it is written by the teaching staff together under the supervision of scientific commmmittees in the scientific departments. In this regard, we can only emphasize the important of writing an academic programs and course description to ensure the proper functioning of the educational process.

1-2 Academic Program Description

The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

1-3 Course Description

Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

1-4 Program Vision

An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

1-5 Program Mission

Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

1-6 Program Objectives

They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

1-7 Curriculum Structure

All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

1-8 Learning Outcomes

A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

1-9 Teaching and learning strategies

They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extra-curricular activities to achieve the learning outcomes of the program.

2. Academic Program Description Form

University Name:	Wasit
Faculty/Institute:	College of Science
Scientific Department:	physics
Academic or Professional Program Name:	Master of Science in Physics
Final Certificate Name:	Master's degree in physics
Academic System:	Semester
Description Preparation Date:	2025-2026
File Completion Date:	30/6/2025

Approvals and Signatures

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

2-1 Program Vision

Postgraduate studies (master's) were opened in the department of physics in the academic year 2011/2012. The department aims to graduate highly qualified students qualified to work in all aspects of life.

*Study period: 2 years,

* Study Language: English

2-2 Program Mission

- Due to the use of physical science in all areas of life and in various other sciences, there has
- become a need for graduates who hold a master's degree in physical sciences to work in public and private institutions.

2-3 Program Objectives

- Department of physics focuses on achieving a number of objectives. They can be summarized as follows: providing efficient graduates, highly qualified
- in the field of physics, keeping pace with the fast changes in the field of IT and analysis of data, focusing on scientific research and its essential role in serving the community by conducting scientific and applied research,striving to improve performance so as to achieve comprehensive quality assurance.

2-4 Program Accreditations

This mission of the department is summarized in providing graduates , qualifiedand highly trained in the field of physics .

2-5 other external influences

2-6 Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	2	4		
College Requirements				
Department Requirements	14	24		
Summer Training				
Other				

2-7 Program Description

Year/Level	Course Code	Course Name	Credit Hours		
2025-2026			theoretical	practical	tutorial
Semester 1	PHY5101	Electromagnetic Theory	2		
Semester 1	PHY5102	Advanced Quantum Mechanics	2		
Semester 1	PHY5103	Advanced Nuclear physics	2		
Semester 1	PHY5104	Advanced Optics	2		
Semester 1	PHY5105	Advanced Mathmetics	2		
Semester 1	UOW5100	English language (1)	1		
Semester 1	UOW5200	Research Methodology(1)	1		
Semester 2	PHY5201	Solid State Physics	2		
Semester 2	PHY5202	Plasms Physics	2		
Semester 2	PHY5203	Thin Film	2		
Semester 2	PHY5204	Remote Senesing	2		
Semester 2	PHY5205	Special Topic	2		
Semester 2	UOW5300	English language (2)	1		
Semester 2	UOW5400	Research Methodology (2)	1		

2-8 Expected learning outcomes of the program

Knowledge

1- That the student knows the basics of the required sciences.

2- That the student understands the required scientific details.

3- The student should analyze scientific developments.

4- Graduation of scientific cadres with specialization .

5-Enabling students to obtain knowledge, intellctual understanding, and skills to devices.

6-Teaching the student the skills required to deal with different cases.

Skills

1- That the student uses the devices correctly.

2- That the student applies what has learned in practice.

3- The student must bring the necessary materials.

4- Good knowledge of the principles of physics and related sciences.

5- Technical ability in his field of work.

6- Good knowledge of the english language .

7- That the student performs the appropriate proceduresfor the situations he faces.

Ethics

1- Working as ateam.

2- That the student recgnizes the important of academic subjects.

3- Commitment to the ethics of the university institution

4-Receiving information and cognitive receptivity.

2-9 Teaching and Learning Strategies

1- Classroom education through theoretical lectures.

2- Preparing scientific reports and research.

3- Show educational videos during the lecture.

2-10 Evaluation methods

1- Exams.

2-Writing and presenting reports and research.

3-Scientific discussions.

4- For daily attendance and activities.

2-11 Faculties

Academic Rank	Specialization		Special Requirements/Skills (if applicable)	Number of the teaching staff	
	General	Special		Staff	Lecturer
Prof. Dr. Hashim Ali Yusr	Physics	Materials physics		Yes	
Prof.Dr. Najwa Jassim Jubier	Physics	Materials physics		Yes	
Prof.Dr. Hadi Dwaich Alattabi	Physics	Nuclear physics		Yes	
Prof Dr. Ahmed Khudhair Abbas	Physics	Plasma physics		Yes	
Prof.Dr.Abbas F. Essa	Physics	Materials physics		Yes	
Prof. Dr Muneer Hlail Alzubaidy	Physics	Semiconductors		Yes	
Assist profesor Dr. Hanan Abd ali thjeel	Physics	Laser and Electroptics		Yes	
Assist Prof Dr. Faik Mayah	Mathematics	Mathematical analysis		Yes	
Assist Prof Dr. Mutasim I.Malik	Physics	Image processing		Yes	
Assist Prof Dr.Khudhair A. Assaf	Physics	Astronomy		Yes	
Assist Prof Dr. Mahdi Ahmed Mohammed	Physics	Nanotechnology		Yes	

- **Professional Development**

Mentoring new faculty members

- Directing new faculty members to the necessity of working on developing the scientific method,
- Methods of delivering scientific lectures, and how to deliver practical material to the student .

- **Mentoring new faculty members**

- Directing new faculty members to the necessity of working on developing the scientific method,
- Methods of delivering scientific lectures, and how to deliver practical material to the student .

- **Professional development of faculty members**

- working to find development ideas and working to develop scientific laboratories and the practical
- Aspect, since the students specilalization is a scientific specialization.

2-12 Acceptance Criterions

- Student who graduate from the colleges of science and education for pure sciences are allowed
- To be accepted into the department.

2-13 The most important sources of information about the program

1- Textbooks prescribed by the ministry of higher education and scientific research.

2- External scientific sources.

3- Using libraries and the internet.

2-14 Program Development Plan

The department has many methodological and research plans in order to develop the department , as the department presidency , the department council , and the scientific committee work to provide all requirements for the development of the department.

3. Program Skills Outline

				Required program Learning outcomes											
Semester	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
Semester 1	PHY5101	Electromagnetic Theory	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	PHY5102	Advanced Quantum Mechanics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	PHY5103	Advanced Nuclear physics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	PHY5104	Advanced Optics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	PHY5105	Advanced Mathematics	optional	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	UOW5100	English (1)	optional	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	UOW5200	Research Methodology (1)	optional	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY5201	Solid State Physics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY5202	Plasmas Physics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY5203	Thin Film	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY5204	Remote Sensing	optional	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY5205	Special Topic	optional	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	UOW5300	English (2)	optional	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	UOW5400	Research Methodology (2)	optional	√	√	√	√	√	√	√	√	√	√	√	√

4.1. Electromagnetic Theory

1. Course Name:	Eelectromagnetic Theory
2. Course Code:	PHY5101
3. Semester / Year:	2025/2026
4. Description Preparation Date:	09/01/2025
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	30 hours /
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr. Hashim Ali YusrEmail: | hashim@uowasit.edu.iq

8. Course Objectives	1- Study the fundamental principles of electromagnetic fields. 2- To provide an indepth training on the basic mathematical skills for quantitative analysis of electromagnetic phenomena 3- To provide basic training related to the nature of electromagnetic wave and its propagation through different media and its behavior at interfaces of different media. 4- To provides basic electromagnetic skills, which concern the fundamental laws of electromagnetic propagation and radiation 5- Acquire the knowledge of electromagnetic field theory, that allows the student to have a solid theoretical foundation to be able in the future to design emission, propagation and reception of electromagnetic waves systems 6- Identify, formulate and solve fields and electromagnetic waves propagation problems in a multidisciplinary frame individually or as member of a group.
9. Teaching and Learning Strategies	1- Direct lesson given by the teacher and interactive exercises. 2- Method of Lecture, discussion and brainstorm 3- Teaching methods include the use of educational technology

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	2	Faraday law , Transformer and Motional Electromotive Force	Review of Maxwell Equations	lecture-based instruction	
2-	2	Displacement Current , Final Form of Maxwell Equations	Review of Maxwell Equations	lecture-based instruction	Assignment
3-	2	Waves in General	Electromagnetic Wave Propagation	lecture-based instruction	
4-	2	Wave Propagation in Lossy Dielectrics ,and in Lossless Dielectrics	Electromagnetic Wave Propagation	lecture-based instruction	Assignment
5-	2	Plane Waves in Free Space , and in Good Conductors	Electromagnetic Wave Propagation	lecture-based instruction	
6-	2	Power and the Poynting Vector	Electromagnetic Wave Propagation	lecture-based instruction	Assignment

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
7-	2	Reflection of a Plane Wave at Normal , and Oblique Incidence	Electromagnetic Wave Propagation	lecture-based instruction	
8-	2	Transmission Line Parameters and Equations	Transmission Line	lecture-based instruction	Assignment
9-	2	Input Impedance, Standing Wave Ratio, and Power	Transmission Line	lecture-based instruction	
10-	2	Rectangular Waveguides	Waveguides	lecture-based instruction	Assignment
11-	2	Input Impedance, Standing Wave Ratio, and Power	Waveguides	lecture-based instruction	
12-	2	Wave Propagation in the Guide , Power Transmission and Attenuation	Waveguides	lecture-based instruction	Assignment
13-	2	Waveguide Current and Mode Excitation , Waveguide Resonators	Waveguides	lecture-based instruction	
14-	2	Antennas Characteristics	Antennas	lecture-based instruction	Assignment
15-	2	Antennas Arrays , Radar Equations	Antennas	lecture-based instruction	

11. Course Evaluation

The final exam is worth 60% of the total grade and other 40% is divided into 30% for two tests (each 15 marks) and 8 marks for participation, activities and homework and 2 marks for attendance

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Foundations of Electromagnetic Theory (4th Edition) By John R. Reitz, Frederick J. Milford
	[2]
	[3]
	[4]
	[5]
Main references (sources)	[1] Elements of Electromagnetics by Sadiku 2nd Ed.OxfordUniv.Press. Inc. (2018).
	[2]
	[3]
	[4]
	[5]

Recommended books and references (scientific journals, reports...)	[1]
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1] On-line resources to be used if available as reference material
	[2]
	[3]
	[4]
	[5]

4.2. Advanced Quantum Mechanics

1. Course Name:	Advanced Quantum Mechanics
2. Course Code:	PHY5102
3. Semester / Year:	First Semester(2025-2026)
4. Description Preparation Date:	09/01/2025
5. Available Attendance Forms:	Actual Attendance(presence)
6. Number of Credit Hours (Total) / Number of Units (Total)	(2 Hours of Theory in the week) / 2 Unit
7. Course administrator's name (mention all, if more than one name)	Name: | Name: Prof.Dr. Najwa Jassim JubierEmail: | Email: njassim@uowasit.edu.iq

8. Course Objectives	1- To impart knowledge of advanced quantum mechanics for solving relevant physical problems. 2- understanding the Hilbert-space formalism of modern quantum mechanics, with bra-ket and matrix notations, and the role of symmetries and related conservation laws 3- To formulate and solve problems in quantum mechanics using Dirac representation. 4- understanding density matrices for single and joint Hilbert spaces, the difference between pure and mixed states, and entanglement 5- To grasp the concepts of spin and angular momentum, as well as their quantization and addition rules. 6- The course examines advanced Quantum Physics topics central to modern theoretical physics. These include advanced concepts of wave packet propagation and spreading (Motion of a free particle) 7- Understand the ladder operator method for studying quantum systems with discrete energy levels, such as harmonic oscillators and angular momentum systems. Students will learn how ladder 8- Identify key differences between classical and quantum systems and how those differences affect the operation of quantum technologies. 9- Students will learn how ladder operators enable the calculation of energy Eigen states, energy spectra, and transition probabilities between states.
9. Teaching and Learning Strategies	1- Group discussions and assignments 2- Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods. 3- Research groups - nested discussion circles. 4- Teaching methods include the use of educational technology. 5- Encouraging students to self-learn.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	(Two Th.)		The Physical Foundations of Quantum Physics	Lecture and discussion	Exams, assignments, and quizzes
2-	(Two Th.)	These learning outcomes form the foundational understanding required to delve deeper into quantum mechanics, providing a solid framework to comprehend the behavior of particles at the microscopic scale and the mathematical tools used to describe them	Quantum mechanics principles, Hilbert space, Dirac notation, Scalar product, Physical meaning of the scalar product, Normalization, Supper position principle, completeness		

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
3-	(Two Th.)	Apply the fundamental principles of quantum theory to formulate and solve technical problems related to quantum technology.	Operators, Hermition operators, Expectation value and probability of measurement, examples		
4-	(Two Th.)	understanding the algebraic structure of quantum mechanics, particularly how operators interact and how their properties influence the description and measurement of physical quantities in quantum systems.	Commutators, Commute Operator, Simultaneous Eigen functions		
5-	(Two Th.)	students can effectively analyze and manipulate quantum systems using different representations, gaining a deeper understanding of quantum mechanics and its mathematical foundations. These concepts are crucial for advancing further into the study of quantum mechanics, including more complex topics such as wave packet dynamics, angular momentum, and quantum field theory.	Matrix Representation, Coordinate representation, Momentum representation, examples		
6-	(Two Th.)		EXAM 1		
7-	(Two Th.)	Understanding the concept of a free particle in quantum mechanics, which is a particle that is not subject to any external forces or potentials. Definition and understanding of phase velocity in the context of quantum mechanics. Understanding the concept of a wave packet as a localized wave-like solution in quantum mechanics.	Free particle, phase velocity, wave packet		

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
8-	(Two Th.)	Understanding Heisenberg's uncertainty principle, Explaining the concept of a wave packet as a localized wave in space, typically characterized by a minimum uncertainty in position and momentum. A wave packet is a superposition of waves of different frequencies, allowing for a more precise definition of position at the cost of a broader range of momentum values, and vice versa. Understanding how a wave packet is constructed to satisfy the minimum uncertainty principle	Exact statement of the uncertainty principle, From minimum wave packet to satisfy he minimum uncertainty		
9-	(Two Th.)	These learning outcomes provide a comprehensive understanding of how wave packets behave and evolve in quantum mechanics, crucial for understanding the motion and behavior of particles at the quantum level.	Motion of a free particle wave packet		
10-	(Two Th.)	provide a comprehensive understanding of how the occupation number representation and raising/lowering operators are fundamental in quantum mechanics, especially in the context of the Harmonic oscillator model. They lay the groundwork for more advanced studies in quantum theory and applications in various branches of physics.	Occupation number representation for the Harmonic oscillator (Operator method), Raising and Lowering operators		

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
11-	(Two Th.)	for understanding the quantum mechanical description of systems in terms of their energy levels (Hamiltonian eigenvalues), quantized states (number operators), and the stable configurations represented by eigenstates. They form the basis for many advanced concepts and applications in quantum mechanics	Eigen values of H (or H'), Number Operator, Eigen states		
12-	(Two Th.)	Understanding how raising (creation) and lowering (annihilation) operators act on quantum states in the context of quantum harmonic oscillators, angular momentum, or other systems with discrete or continuous spectra. Recognizing the commutation relations and properties of these operators. Understanding how these wave functions describe the probability amplitudes of finding a particle in different regions of space. Discussing the correspondence principle and the conditions under which classical mechanics emerges from quantum mechanics.	Action of the razing and lowering operators, Wave functions in configuration space representation, Classical limit of the motion, The classical probability density, Quantum Mechanical probability density		
13-	(Two Th.)	provide a comprehensive understanding of how wave packets behave in the harmonic oscillator potential, blending theoretical concepts with practical calculations and interpretations crucial for quantum mechanics studies.	wave packet motion in the HO potential		

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
14-	(Two Th.)	To know the related to angular momentum in quantum mechanics, focusing on ladder operators, raising and lowering operators, and commutation relations with L2	Angular momentum By Ladder Operators, The raising and lowering operators, Commutation relations with L2		
15-	(Two Th.)		EXAM 2		

11. Course Evaluation

- Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc Course / Assignments and quizzes/. Exam1/ Exam2/ Final -Exam
- 1st/ 10 /15/ 15/ 60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1]
Main references (sources)	[1] Quantum Mechanics Concepts and Applications Second Edition,Nouredine Zettili,Jacksonville State University, Jacksonville, USA, A John Wiley and Sons, Ltd., Publication, 2009
Recommended books and references (scientific journals, reports...)	[1]
Electronic References, Websites	[1] Sakurai, J.J., Advanced Quantum Mechanics, Pearson Education (2007).
	[2] F. J. DysonADVANCED QUANTUM MECHANICS, Second Edition(2006)
	[3]Advanced Quantum Mechanics: A Practical Guide 1st Edition by Yuli V. Nazarov , Jeroen Dano(2014)
	[4] Mathews, P.M. and Venkatesan K.A., Textbook of Quantum Mechanics, Tata McGraw Hill (2004).

4.3. Advanced Nuclear Physics

1. Course Name:	Advanced nuclear physics
2. Course Code:	PHY5103
3. Semester / Year:	Second Semester(2025-2026)
4. Description Preparation Date:	09/01/2025
5. Available Attendance Forms:	Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	(2 Theory+1 Tutorial)
7. Course administrator's name (mention all, if more than one name)	Name: | Prof.Dr. Hadi Dwaich AlattabiEmail: | alattabih@uowasit.edu.iq
8. Course Objectives	1- Understanding and realizing physical systems that consist of two or more particles in the concept of physics in the microscopic state 2- Benefit from applying the Schrödinger equation to obtain the wave function, for example, for a deuteron
9. Teaching and Learning Strategies	1- Group discussions and assignments 2- Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	(2 Th+1 Tu)		Brief review of the mehanis atomic particles	Theoretical	
2-	(2 Th+1 Tu)		relativistic particle dynamics	Theoretical	
3-	(2 Th+1 Tu)		motion of charged in magnetic fields	Theoretical	
4-	(2 Th+1 Tu)		wave particle duality	Theoretical	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
5-	(2 Th+1 Tu)		the uncertainty principle	Theoretical	
6-	(2 Th+1 Tu)		wave functions	Theoretical	
7-	(2 Th+1 Tu)		operators	Theoretical	
8-	(2 Th+1 Tu)		the schrodinger equation	Theoretical	
9-	(2 Th+1 Tu)		spherical coordinate and harmonic functions	Theoretical	
10-	(2 Th+1 Tu)		parrity and orbit angllar momentum	Theoretical	
11-	(2 Th+1 Tu)		the two body problem in wave mechanics	Theoretical	
12-	(2 Th+1 Tu)		ion beam focusing and dispersion in electric and magneti field ,equation of motion	Theoretical	
13-	(2 Th+1 Tu)		sector field,dispersion	Theoretical	
14-	(2 Th+1 Tu)		Time dependent perturbution theory general first order theory	Theoretical	
15-	(2 Th+1 Tu)		matrix diagonalization	Theoretical	

11. Course Evaluation

First month exam: 20 degree ,seccond month exam :20 degree , Final exam : 60 degree

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Introdution to nuclear physics HARALD A. ENGE
	[2] basics of nucllear physics Meyerhof , published 1982
	[3]
	[4]
	[5]
Main references (sources)	[1]
	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1]
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1]
	[2]
	[3]
	[4]
	[5]

4.4. Optics

1. Course Name:	Advanced Optics
2. Course Code:	PHY5104
3. Semester / Year:	I semester/ 2025-2026
4. Description Preparation Date:	09/01/2025
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	30 hours / 6 units
7. Course administrator's name (mention all, if more than one name)	Name: | Assist profesor Dr. Hanan Abd ali thjeelEmail: | halukely@uowasit.edu.iq

8. Course Objectives	1- To impart knowledge about various Physical tools employed to study • Problems in Quantum optics. 2- Enabling the student to acquire basic English language skills. 3- Make the students familiar with the physical concepts that used frequently in • Quantum physics. 4- Enhance students' ability in solving mathematical problems. 5- To increase the students' background about nonlinear optics and quantum optics. 6- Enable the student to delves into light's wave nature, going beyond basic ray optics to cover wave phenomena (diffraction, interference, polarization), Fourier optics, laser physics, and nonlinear optics, exploring light's interaction with matter and its applications in cutting-edge technologies like nanophotonics, quantum optics, ultrafast optics, and biophotonics, using tools like waveguides, optical fibers, and sophisticated detectors. It bridges classical physics with modern quantum mechanics, essential for fields from telecommunications to medicine.
9. Teaching and Learning Strategies	1- Through teaching theoretical material by the instructor 2- Making the students involved in various activities 3- Use visual tools such as videos to understand the solutions and functions that allow students to grasp information more effectively.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	2	description of matter–light interaction	-delves into light's wave nature, going beyond basic ray optics to cover wave phenomena	Lecturebasedinstruction	
2-	2		Dual Nature of Light		
3-	2		Maxwell's EM wave theory		
4-	2		superposition and coherence		
5-	2		interference		
6-	2		test		

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
7-	2		diffraction		
8-	2		polarization		
9-	2		matrix treatment of polariztion - jones vectors		
10-			types of polarization		
11-	2	Principles of lasers	laser physics		
12-	2		Description of the amplifying media of some lasers		
13-	2		nonlinear optics		
14-	2		second harmonic generation		
15-	3		Final Test		

11. Course Evaluation

• Distributing the score out of 100 according to the tasks assigned to the student such as daily
• Preparation, daily oral, monthly, or written exams, reports .... etc
• The final exam is worth 60% of the total grade and other 40% is divided into 30% for two
• Tests (each 15 marks) and 8 marks for participation, activities and homework and 2 marks
• For attendance.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] introduction to optics,FRANK L. PEDROTTI, S.J.LENO M. PEDROTTI,third edition
	[2]
	[3]
	[4]
	[5] nonlinear optics, Robert Boyd , 2nd edition
Main references (sources)	[1]
	[2]
	[3]
	[4]
	[5]

Recommended books and references (scientific journals, reports...)	[1] Laser Cooling below the One-Photon Recueil Energy by Velocity-Selective Coherent Population Trapping, Physical Review Letters 61, 826(1988).
	[2] M. Greiner, O. Mandel, T. Esslinger, T. W. Hänsch and I. Bloch, Quantum Phase Transition from a Superfluidto a Mott Insulator in a Gas of Ultracold Atoms, Nature 415, 39 (2002).
	[3]
	[4]
	[5]
Electronic References, Websites	[1]
	[2]
	[3]
	[4]
	[5]

4.5. Advanced Mathematics

1. Course Name:	Advanced Mathematics
2. Course Code:	PHY5105
3. Semester / Year:	Semester 1 / Year 2025-2026
4. Description Preparation Date:	09/01/2025
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	30 hours / 4 units
7. Course administrator's name (mention all, if more than one name)	Name: | Assist Prof Dr. Faik MayahEmail: | fmayah@uowasit.edu.iq
8. Course Objectives	1- To impart knowledge about various mathematical tools employed to study problems in physics. 2- Enabling the student to acquire skills of solving problems in mathematical physics. 3- Make the students familiar with the mathematical concepts that used frequently in mathematical phyisics. 4- Enhance students' ability in solving mathematical problems. 5- To increase the students' background about mathematical physics. 6- Enable the student to acquire the mathematical physics necessary for the scientific aspects. 7- Enable the student to employ the mathematical equations (models) for the purposes of academic study and research.
9. Teaching and Learning Strategies	1- Through teaching theoretical material by the instructor 2- Making the students involved in various activities 3- Use visual tools such as Mat lab to plot the solutions and functions that allow students to grasp information more effectively.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	2	Convergence of infinite series; Power series; Taylor series	Infinite Series and Power Series, Chapter 4 of Riley's Book.	Lecture-based instruction	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
2-	2	Simple Harmonic Motion and Wave Motion; Periodic Functions; Applications of Fourier Series; Fourier Coefficients	Fouries Series: Chapter 7, Sections: 1-4	Lecture-based instruction	Assignment
3-	2	Dirichlet Conditions; Complex Form of Fourier Series; Even and Odd Functions	Fouries Series: Chapter 7, Sections: 5-8	Lecture-based instruction	
4-	2	An Application to Sound; Parseval's Theorem; Fourier Transforms	Fouries Series: Chapter 7, Sections: 9-12	Lecture-based instruction	Assignment
5-	2	Introduction to the Gamma and Beta Functions; Relation between Beta and Gamma functions; Harmonic Series and Digamma functions.	Some Special Functions: Chapter 11, Sections 1-7	Lecture-based instruction	
6-	2	Relation between Harmonic Series and Digamma functions; Error function; Asymptotic series; Stirling's Formula; Elliptic integrals and functions.	Some Special Functions: Chapter 11, Sections 8-13	Group learning	Report
7-	2	Test			Examination
8-	2	Legendre's Equation; Leibniz' Rule for Differentiating Products; Rodrigues' Formula; Generating Function for Legendre Polynomials	Series Solutions of Differential Equations: Chapter 12: Sections 2-5.	Lecture-based instruction	
9-	2	Orthogonality of the Legendre Polynomials; Normalization of the Legendre Polynomials; Legendre Series	Series Solutions of Differential Equations: Chapter 12, Sections: 6-9.	Lecture-based instruction	Assignment
10-	2	The Associated Legendre Functions; Generalized Power Series or the Method of Frobenius; Bessel's Equation; The Second Solution of Bessel's Equation; Graphs and Zeros of Bessel Functions; Recursion Relations	Series Solutions of Differential Equations: Chapter 12, Sections: 7-15.	Lecture-based instruction	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
11-	2	Differential Equations with Bessel Function Solutions; Orthogonality of Bessel Functions; Approximate Formulas for Bessel Functions	Series Solutions of Differential Equations: Chapter 12, Sections: 16-20.	Lecture-based instruction	Assignment
12-	2	Integral Transform Solutions of Partial Differential Equations	Partial Differential Equations, Chapter 13: Section 9.	Lecture-based instruction	
13-	2	Analytic Functions; Contour Integrals; Laurent Series; The Residue Theorem; Methods of Finding Residues	Functions of Complex Variables: Chapter 14, sections 2-6.	Group learning	Report
14-	2	Evaluation of Definite Integrals by Use of the Residue Theorem; The Point at Infinity; Residues at Infinity; Some Applications of Conformal Mapping	Functions of Complex Variables: Chapter 14, sections 7-10.	Lecture-based instruction	
15-	2	Test			Examination

11. Course Evaluation

- Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc
- The final exam is worth 60% of the total grade and other 40% is divided into 30% for two tests (each 15 marks) and 8 marks for participation, activities and homework and 2 marks for attendance.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Mary L. Boas, Mathematical Methods in the Physical Sciences 3rd Edition, John Wiley & Sons, Inc. 2006. (ISBN 0-471-19826-9).
	[2]
	[3]
	[4]
	[5]

Main references (sources)	[1] K. F. Riley, M. P. Hobson and S. J. Bence, Mathematical Methods for Physics and Engineering: A Comprehensive Guide 3rd Edition, Cambridge University Press, 2006. (ISBN 978-0-521-86153-3).
	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1]
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1] Click here :: Infinite Series and Power Series
	[2] Click here :: Fouries Series
	[3] Click here :: Special Functions
	[4] Click here :: Series Solutions of DEs (The Frobenius Method)
	[5] Click here :: Legendre’s Equation
	[6] Click here :: Bessel’s Equation
	[7] Click here :: Integral Transform Solutions of PDEs
	[8] Click here :: Analytic Functions
	[9] Click here :: Laurent Series
	[10] Click here :: Residue Theorem

4.6. English (1)

1. Course Name:	English (1)
2. Course Code:	UOW5100
3. Semester / Year:	Master/ First Semester/2025-2026
4. Description Preparation Date:	09/01/2025
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	/
7. Course administrator's name (mention all, if more than one name)	Name: | Assist Prof Dr.Khudhair A. AssafEmail: | kassaf@uowasit.edu.iq
8. Course Objectives	1- Develop the ability to listen, speak, read, and write effectively in English. 2- Enable students to use English effectively in everyday life, professional settings, and academic contexts. 3- Foster knowledge of grammar, vocabulary, pronunciation, and syntax 4- Build confidence in using English through practice and positive reinforcement 5- Prepare students for various English proficiency tests and academic exams.
9. Teaching and Learning Strategies	

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-		How to listen • Factors which affect listening	Unit 1	Lecture-discussion	Quizzes and Tests
2-		Reading methods: skim ; scan ; intensive reading ; extensive reading	Unit 1	Lecture-discussion	Quizzes and Tests
3-		Predicting content: thinking about the title, subject, important words , Listening for gist	Unit 2	Lecture-discussion	Quizzes and Tests

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
4-		Skimming and scanning: reading for the general idea , and for particular information	Unit 2	Lecture-discussion	Quizzes and Tests
5-		Recognizing signposts: because, because of, for instance	Unit 3	Lecture-discussion	Quizzes and Tests
6-		M eaning from context: guessing the meaning of new words	Unit 3	Lecture-discussion	Quizzes and Tests
7-			Exam		
8-		Using visuals: studying pictures and diagrams	Unit 4	Lecture-discussion	Quizzes and Tests
9-		Identifying the m ain message: using topic sentences to identify paragraph content	Unit 4	Lecture-discussion	Quizzes and Tests
10-		Distinguishing speakers: listening for different accents and tonesDistinguishing levels of formality	Unit 5	Lecture-discussion	Quizzes and Tests
11-		Purpose and audience (1 an d 2): using visual and written clues	Unit 5	Lecture-discussion	Quizzes and Tests
12-		Studying some of verbs tenses			Quizzes and Tests
13-		Prepositions			Quizzes and Tests
14-					
15-			Exam		

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Headway Academic Skills
	[2] Headway Academic Skills Reading, Writing, and Study Skills

	[3]
	[4]
	[5]
Main references (sources)	[1]
	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1]
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1]
	[2]
	[3]
	[4]
	[5]

4.7. Research Methodology (1)

1. Course Name:	Research Methodology (1)
2. Course Code:	UOW5200
3. Semester / Year:	2025-2026
4. Description Preparation Date:	09/01/2025
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	45292
7. Course administrator's name (mention all, if more than one name)	Name: | Assist Prof Dr. Mahdi Ahmed MohammedEmail: | mahmed@uowasit.edu.iq
8. Course Objectives	1- Enable the student to know the scientific journals 2- Knowing the importance of publishing 3- Knowing the importance of publishing in high rank journals 4- Ability to distinguish a good journal from predatory, hijacked, and trade journals
9. Teaching and Learning Strategies	1- Knowing the way of publishing in journals 2- Knowing the journals that are free of charge 3- Knowing the qualification of the journal from the cite score and impact factor 4- Knowing the future of journal from its cite score 5- Knowing predatory, hijacked, and trade journals 6- The ability to choose the right journal

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	1	Knowing scientific journals and publishing company	What is Journals? - Publishing Company	Lecture + discussion	Tests
2-	1	Knowing peer review and blind peer review	Review, Peer Review	Lecture + discussion	Tests
3-	1	Identify the open, closed, and hybrid access journals	Open, close, and hybrid access journals	Lecture + discussion	Tests
4-	1	Ability to see the rank of journals	Classification of Journal in SJR and Scopus	Lecture + discussion	Tests

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
5-	1	Doing practice of the previous lecture	Practicing	Lecture + discussion	Tests
6-	1	Knowing the calculation of the cite score and impact factor and compare between them	Cite Score & Impact factor	Lecture + discussion	Tests
7-	1	Ability to know 5 steps to discover predatory journals	1- Steps to know predatory journals	Lecture + discussion	Tests
8-	1	Ability to know the other 4 steps to discover predatory journals	2- Steps to know predatory journals	Lecture + discussion	Tests
9-	1	Doing practice of the previous two lectures	Practicing	Lecture + discussion	Tests
10-	1	Ability to know steps to discover hijacked journals	Steps to know hijacked journals	Lecture + discussion	Tests
11-	1	Doing practice of the previous lecture	Practicing	Lecture + discussion	Tests
12-	1	Steps to choose a suitable journal	How to choose the right journal for your article	Lecture + discussion	Tests
13-	1	Doing practice of the previous lecture	Practicing	Lecture + discussion	Tests
14-					
15-					

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1]
	[2]
	[3]
	[4]
	[5]
Main references (sources)	[1]

	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1]
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1] https://jor.rdd.edu.iq/
	[2] https://www.scimagojr.com/journalrank.php
	[3] https://www.scopus.com/sources.uri?zone=TopNavBar&origin=sourceinfo
	[4] https://portal.issn.org/
	[5] https://beallslist.net/

5. Course Descriptions – Semester 2

5.1. Solid State Physics

1. Course Name:	Solid state physics
2. Course Code:	PHY5201
3. Semester / Year:	Second Semester(2025-2026)
4. Description Preparation Date:	02/01/2026
5. Available Attendance Forms:	Actual Attendance(presence)
6. Number of Credit Hours (Total) / Number of Units (Total)	(2 Hours of Theory in the week) / 2 Unit
7. Course administrator's name (mention all, if more than one name)	Name: | Name: Prof.Dr.Abbas F. EssaEmail: | Email: afadhel@uowasit.edu.iq
8. Course Objectives	1- To study the advance subjects of solid state physics . 2- To study the Magnetic Properties of Materials. 3- To know and use principles of Energy band theory of Solid. 4- Students learn how to prepare samples for each device, the device's components, and how it works, in addition to the Limitations and resolution of the device. 5- Utilize the structure-properties relationship to predict the properties of a material. 6- To distinguish between Dielectric and electric materials.
9. Teaching and Learning Strategies	1- Group discussions and assignments(report and seminar) 2- Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods. 3- Research groups - nested discussion circles. 4- Teaching methods include the use of educational technology. 5- Encouraging students to self-learn.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	(Two Th.)	To know how to select the materials and properties appropriate for a specific application.	Crystal Defect Or Imperfection in Crystal	Lecture and discussion	Exams, report and seminar
2-	(Two Th.)	Understand The solidification for studying crystal structures	The solidification	Lecture and discussion	Exams, report and seminar

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
3-	(Two Th.)	Understand Classification of alloys for studying elemental composition.	Classification of alloys	Lecture and discussion	Exams, report and seminar
4-	(Two Th.)	Identify the constitution of the alloy	Constitution of alloy	Lecture and discussion	Exams, report and seminar
5-	(Two Th.)	Understand the Basics of SEM: Grasp the basic principles of how SEM works, including the generation of electron beams and the interaction of electrons with the sampleand the concepts of resolution, magnification, and depth of field in SEM and how they affect the quality of the images,for characterizing the surface morphology and composition of materials.	Husion in Solid)	Lecture and discussion	Exams, report and seminar
6-	(Two Th.)	Understand the basic principles of EDS, including the interaction of X-rays with matter, generation of characteristic X-rays, and the energy-dispersive detection of these X-rays and used for the elemental analysis or chemical characterization of materials	Diffusion	Lecture and discussion	Exams, report and seminar
7-	(Two Th.)	Learn about Elastic Constants and Elastic behavior in materials .	Elastic Constants and Elastic behavior	Lecture and discussion	Exams, report and seminar
8-	(Two Th.)		EXAM 1	Lecture and discussion	Exams, report and seminar
9-	(Two Th.)	Understand the Plastic behaviorand its influence in the different materials.	Plastic behavior	Lecture and discussion	Exams, report and seminar
10-	(Two Th.)	Understand the relationship between stress and strain	(Stress _Strain) Relationship	Lecture and discussion	Exams, report and seminar
11-	(Two Th.)	Understand the basic principles of planes of symmetry in materials	Planes of Symmetry	Lecture and discussion	Exams, report and seminar
12-	(Two Th.)	Understand the Superconductivity in different materialds	Superconductivity	Lecture and discussion	Exams, report and seminar

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
13-	(Two Th.)	Understand theLondon Equation.	London Equation	Lecture and discussion	Exams, report and seminar
14-	(Two Th.)	Define and explain the concepts of Josephson Junction.	Josephson Junction	Lecture and discussion	Exams, report and seminar
15-	(Two Th.)		EXAM 2		

11. Course Evaluation

• Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

Course / Reports and Seminars/. Exam1/ Exam2/ Final -Exam

• 2nd/ 10 /15/ 15/ 60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1]
Main references (sources)	1- kittle,"solid state physics" 8th edition
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	1- On-line resources to be used if available as reference material
	2-

5.2. Plasma Physics

1. Course Name:	Plasma Physics
2. Course Code:	PHY5202
3. Semester / Year:	Semester system / 2025-2026 – Semester 2
4. Description Preparation Date:	02/01/2025
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	30 hours (2 hours per week)
7. Course administrator's name (mention all, if more than one name)	Name: | Prof Dr. Ahmed Khudhair AbbasEmail: | aalzubaidi@uowasit.edu.iq
8. Course Objectives	1- Qualifying and training the student and teaching him the basic concepts of Plasma Physics. 2- Qualifying and training the student and teaching him the Methods of plasma generation and plasma sources. 3- Qualifying and training the student and teaching him the different Plasma parameters and Plasma diagnostics.
9. Teaching and Learning Strategies	1- • Explanation and clarification through lectures 2- • Self-education through homework 3- • Reports and projects 4- • Solving difficult problems using scientific material 5- • Use of e-learning

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1+2	4	Plasma concept and Classification, Methods of plasma generation and plasma sources, Degree of ionization, Saha Equation, Plasma vs gas	Basic Concepts	Explanation + discussion	Daily and monthly exams and group discussions
3+4+5	6	(speed – energy- temperature), Plasma oscillations and Plasma frequency, Plasma Criteria, Debye shielding and Debye length, The Plasma parameter, Debye number, Collisions	Basic parameters	Explanation + discussion	Daily and monthly exams and group discussions

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
6+7+8	6	Uniform E and B fields: Gyration, Uniform B fields: Cyclotron frequency, Helical motion: particle pitch angle, Uniform E and B fields: E x B drift, Particle drifts in crossed E and B fields	Single particle motion	Explanation + discussion	Daily and monthly exams and group discussions
9+10+ 11+12	8	Drifts in non-uniform magnetic fields, Grad- B drift, Curvature drift, Curvature and Grad- B drift, Adiabatic invariance of magnetic moment, Magnetic mirroring, First adiabatic invariant, Consequences of invariance of μ: magnetic mirroring, The lose cone	Drifts in uniform and non- uniform fields	Explanation + discussion	Daily and monthly exams and group discussions
13+14 +15	6	REMOTE DIAGNOSTICS, Langmuir Probes, Other local diagnostics: magnetic probes, energy analyzers, RF current probe, Plasma oscillation probe	Plasma Diagnostics	Explanation + discussion	Daily and monthly exams and group discussions

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Francis F. Chen, introduction to Plasma Physics and controlled Fusion, 2016
	[2] Introduction to Plasma Physics , A.Dr. A Zionist boy
	[3] Patrick H. Diamond, Modern Plasma Physics
	[4] Fundamentals of Plasma Physics, J.A. Bittencourt
Main references (sources)	[1] S.N. Sen, Plasma Physics (Plasma state of matter)
	[2] Urman S. Inan, Principles of Plasma Physics for engineers and scientists
	[3] Richard Fitapatric, Plasma Physics an introduction
	[4] Basudev Ghosh, Basic Plasma Physics
	[5] Plasma Physics and its Applications for Science and Engineering Students, Dr.Yousef Shuaib Mohammed

Recommended books and references (scientific journals, reports...)	[1] Journal of Plasma Physics
	[2] Journal of Plasma Physics and controlled fusion
	[3] IEEE Transactions on Plasma Science
	[4] Plasma sourses science and technology
Electronic References, Websites	[1] https://ocw.mit.edu/courses/22-611j-introduction-to-plasma-physics-i-fall-2003/pages/lecture-notes/
	[2] http://homepage.physics.uiowa.edu/~ghowes/teach/phys194/lec194.html
	[3] https://homepages.dias.ie/gallagpt/lectures/PlasmaPhysics/

5.3. Thin Film

1. Course Name:	Thin Film
2. Course Code:	PHY5203
3. Semester / Year:	2nd semester 2025-2026
4. Description Preparation Date:	02/01/2026
5. Available Attendance Forms:	actual attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr Muneer Hlail AlzubaidyEmail: | malzubaidy@uowasit.edu.iq
8. Course Objectives	1- To import knowledge about films 2- Give student knowledge about thin films and how important it is 3- Study the thin film technology 4- Giving information to the student about the types of techniques and PVD methods for preparing thin films 5- Giving information about each method of preparing films by PVD 6- Give information about the benefits and limitations of each film deposition method by PVD 7- Giving information to the student about the types of techniques and CVD methods for preparing thin films 8- Give information about the benefits and limitations of each film deposition method by CVD 9- Give information about the benefits and limitations of each film deposition method by CVD 10- Give student knowledge about electro-optic effect in quantum structures
9. Teaching and Learning Strategies	1- Adopting the discussion method 2- Using of the interactive way of learning 3- Research groups - nested discussion circles. 4- Making the students involved in various activities

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	2	Preparation Methods , Physical methods: Thermal evaporation, Cathodic sputtering,			
2-	2	Preparation Methods , Physical methods: Molecular beam epitaxy and Laser ablation methods.			
3-	2	Preparation Methods , Physical methods: sputtering deposition methods			
4-	2	Preparation Methods , Chemical methods CVD Reaction Types			
5-	2	Preparation Methods , Chemical methods: Electrolytic deposition, Chemical vapor deposition.			
6-	2	Preparation Methods , Chemical methods: Atmospheric-pressure chemical vapour deposition:			
7-	2	Preparation Methods , Chemical methods: Metalorganic chemical vapor deposition (MOCVD) , PECVD , PHCVD, Spray Pyrolysis.			
8-	2	Thickness Measurement and Characterization , Electrical, Mechanical, Optical, Microbalance, Quartz crystal methods. Analytical techniques of characterization: X-ray diffraction, Electron microscopy, High and low energy electron diffraction, Auger emission spectroscopy.			

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
9-	2	Growth and Structure of FilmsLearning Objectives , General Features, Nucleation theories, Effect of electron bombardment on film structure, Post-nucleation growth, Epitaxial film growth, Structural defects.			
10-	2	Properties of Thin Films , Mechanical properties: Elastic and Plastic behavior.			
11-	2				
12-	2	Optical properties: Reflectance and transmittance spectra, Absorbing films, Optical constants of film material, Multilayer films.			
13-	2	Electrical properties: Conductivity in metal, Semiconductor and Insulating films, Discontinuous films, Superconducting films.			
14-	2	Thin Film DevicesLearning Objectives			
15-	2	Exam			

11. Course Evaluation

• The final exam is worth 60% of the total grade and other 40% is divided into 30% for two
• Tests (each 15 marks) and 8 marks for participation, activities and homework and 2 marks
• For attendance.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Handbook of Thin Film Technology ,Hartmut Frey, Hamid R. Khan
	[2]
	[3]
	[4]
	[5]

Main references (sources)	[1]
	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1]
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1]
	[2]
	[3]
	[4]
	[5]

5.4. Remote Sensing

1. Course Name:	Remote Senesing
2. Course Code:	PHY5204
3. Semester / Year:	2 semester/ year 2025-2026
4. Description Preparation Date:	02/01/2026
5. Available Attendance Forms:	actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	30 hour
7. Course administrator's name (mention all, if more than one name)	Name: | Assist Prof Dr. Mutasim I.MalikEmail: | mutasim@uowasit .edu.iq
8. Course Objectives	1- To impart knowledge about various remote sensing tools. 2- Enabling the student to acquire basic English language skills in this field. 3- Make the students familiar with the remote sensing concepts that used frequently in physics. 4- Enhance students' ability in undersatnd satellite imaging problems. 5- To increase the students' background about foundations and concepts of remote sensing 6- Enable the student to employ the remote sensing (models) for the purposes of academic study and research.
9. Teaching and Learning Strategies	1- Through teaching theoretical material by the instructor 2- Making the students involved in various activities 3- Use visual tools such as Matlab to plot the solutions and functions that allow students to grasp information more effectively.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	2	Electromagnetic radiation,	principles of remote sensing	Lecture basedinstruction	6
2-		charactristic of atomospher,			
3-		interaction of electromagnetic with surfaces, types of resolution			

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
4-		type of remote sensing image			
5-		radiometric correction of remote sensing data	image processing	Lecture basedinstruction	Assignment
6-		atmospheric effects			
7-		geometric correction of remote sensing data			
8-		image reduction and magnification	image enhancement	Lecture basedinstruction	Assignment
9-		contrast enhancement			
10-		spatial filter and frquency filter			
11-		edge enhancement			
12-		Transformations		Lecture basedinstruction	Assignment
13-		principals component analysis			
14-		stereo imaging			
15-		Review			

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] principles of remote sensing,claus tempfli,et.al 2001
	[2]
	[3]
	[4]
	[5]
Main references (sources)	[1] Introductory Remote sensing principles and concepts : paul j. Gibson
	[2]
	[3]
	[4]
	[5]

Recommended books and references (scientific journals, reports...)	[1]Remote sensing of environment : journal ,Elsevier, issn: 00344257
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1] foundmental of Remote sensing, tutorial, canada center : https://natural-resources.canada.ca/sites/nrcan/files/earthsciences/pdf/resource/tutor/fundam/pdf/fundamentals_e.pdf
	[2]
	[3]
	[4]
	[5]

5.5. Special Topic

1. Course Name:	Special Topic
2. Course Code:	PHY5205
3. Semester / Year:	Second Semester(2025-2026)
4. Description Preparation Date:	02/01/2026
5. Available Attendance Forms:	Actual Attendance(presence)
6. Number of Credit Hours (Total) / Number of Units (Total)	(2 Hours of Theory in the week) / 2 Unit
7. Course administrator's name (mention all, if more than one name)	Name: | Name: Prof.Dr. Najwa Jassim JubierEmail: | Email: njassim@uowasit.edu.iq
8. Course Objectives	1- The lectures for the course provide a broad overview of a topic. Still, the special topic's purpose is to allow the student to go into more depth in one particular area of the course that they find particularly interesting. This will involve reading material beyond the lectures and writing a report. 2- Prepare students for the research topic by familiarizing themselves with all the tools and devices used to examine the properties of materials. 3- The course aims, to focus on techniques that reveal information about the properties that are measurements for the sample. 4- Students learn how to prepare samples for each device, the device's components, and how it works, in addition to the Limitations and resolution of the device. 5- Utilize the structure-properties relationship to predict the properties of a material. 5- Understand the advantages and disadvantages of each device
9. Teaching and Learning Strategies	1- Group discussions and assignments(report and seminar) 2- Creating an atmosphere of competition among students and treating individual differences using appropriate educational methods. 3- Research groups - nested discussion circles. 4- Teaching methods include the use of educational technology. 5- Encouraging students to self-learn.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	(Two Th.)	To know how to select the materials and properties appropriate for a specific application.	General Introduction	Lecture and discussion	Exams, report and seminar
2-	(Two Th.)	Understand X-ray diffraction (XRD) for studying crystal structures	X-Ray Diffraction		
3-	(Two Th.)	Understand X-ray fluorescence (XRF) for studying elemental composition.	X-Ray Fluorescence (XRF)		
4-	(Two Th.)	Grasp the basic principles of Atomic Force Microscopy, including the interaction of a sharp probe with the surface of a material to produce an image andLearn about different AFM operation modes such as contact mode, tapping mode (intermittent contact), and non-contact mode, and their respective applications.	Atomic Force Microscopy (AFM)		
5-	(Two Th.)	Understand the Basics of SEM: Grasp the basic principles of how SEM works, including the generation of electron beams and the interaction of electrons with the sampleand the concepts of resolution, magnification, and depth of field in SEM and how they affect the quality of the images,for characterizing the surface morphology and composition of materials.	Scanning Electron Microscopy (SEM)		

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
6-	(Two Th.)	Understand the basic principles of EDS, including the interaction of X-rays with matter, generation of characteristic X-rays, and the energy-dispersive detection of these X-rays and used for the elemental analysis or chemical characterization of materials	Energy-dispersive X-ray spectroscopy (EDS, EDX, EDXS or XEDS)		
7-	(Two Th.)	Learn about IR spectroscopy for studying molecular vibrations and identifying functional groups in organic and inorganic compounds.	Fourier-transform infrared spectroscopy (FTIR		
8-	(Two Th.)		EXAM 1		
9-	(Two Th.)	Understand the basic working principles of TEM, including electron beam generation, interaction of electrons with materials, and image formation. Comprehend the concepts of resolution and magnification in TEM, and how they influence the level of detail observable in the sample.	Transmission Electron Microscope (TEM)		
10-	(Two Th.)	Grasp the basic principles of STM, including quantum tunneling, the working mechanism of the STM tip, and the feedback system that maintains the tip-sample distance. Comprehend the role of quantum mechanics in STM operation, specifically the concept of electron tunneling between the tip and the sample.	Scanning Tunneling Microscope(STM)		

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
11-	(Two Th.)	Understand the basic principles of AES, including the Auger process, electron emission, and the significance of surface sensitivity. Comprehend the Auger effect, including the steps of inner-shell ionization, energy transfer, and emission of Auger electrons. Learn about the interactions between incident electrons and the atoms in a material, leading to the ejection of Auger electrons.	Auger Electron Spectroscopy (AES)		
12-	(Two Th.)	Understand the basic principles of ESCA/XPS, including the photoelectric effect and the interaction of X-rays with matter. Learn about binding energy and its significance in determining the electronic state of elements within a material. Grasp the concept of surface sensitivity and how ESCA/XPS is used to analyze the top few nanometers of a material's surface.	Electron Spectroscopy for Chemical Analysis (ESCA)		
13-	(Two Th.)	Understand the principles and applications of UV-Visible spectroscopy in determining electronic transitions and concentration of analytes.	Optical Properties		
14-	(Two Th.)	Define and explain the concepts of stress and strain, including normal and shear stress, and normal and shear strain. Distinguish between elastic and plastic deformation. Explain Hooke's Law and the concept of Young's modulus. Define Poisson's ratio and understand its significance in material deformation.	Mechanical Properties		
15-	(Two Th.)		EXAM 2		

11. Course Evaluation

• Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

Course / Reports and Seminars/. Exam1/ Exam2/ Final -Exam

• 2nd/ 10 /15/ 15/ 60

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1]
Main references (sources)	[1] Fundamentals of Materials Science and Engineering An Integrated Approach5th Edition WILLIAM D. CALLISTER, JR. And DAVID G. RETHWISCH 2015 John Wiley & Sons
	[2] An Introduction to Surface Analysis by XPS and AES John F. Watts, John Wolstenholme May 2003, 224pp, paperback, ISBN 0-470-84713-1.
	[3] Handbook of Spectroscopy. Edited by Günter Gauglitz and Tuan Vo-Dinh Copyright 2003 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim ISBN 3 -527-29782 – 0
	[4] Atomic Force Microscopy: Understanding the Basic Modes and Advanced ApplicationsGreg Haugstad 2012, 464pp, hardcover,ISBN 978-0-470-63882-8
	[5] Microscopic X-Ray Fluorescence Analysis Koen H. A. Janssens, Freddy C. V. Adams, Anders Rindby, editorsJune 2000, 434pp, hardcover,ISBN 0-471-97426-9.
Recommended books and references (scientific journals, reports...)	[1]
Electronic References, Websites	[1] Scanning Electron Microscopy and X-Ray Microanalysis, 3rd Edition Joseph I. Goldstein, Dale E. Newbury, Patrick Echlin & David C. Joy,2005, 820pp, hardcover,ISBN 0-306-47292-9.
	[2] Scanning Auger Electron Microscopy Edited by Martin Prutton, Mohamed M. El Gomati May 2006, 384pp, hardcover,ISBN 0-470-86677-2.
	[3] Electron Microscopy and Analysis, 3rd Edition Peter J. Goodhew, John Humphreys, Richard Beanland,2000, 272pp, softcover,ISBN 0-748-40968-8.
	[4] Scanning and Transmission Electron Microscopy: An IntroductionStanley L. Flegler, John W Heckman, Karen L. Klomparens,1995, reprint of 1993 ed., 240pp, hardcover,ISBN 0-195-10751-9.
	[5] Raman Spectroscopy Advances and Applications Editors:Dheeraj Kumar SinghAshish Kumar MishraArnulf Materny Copyright: 2024

5.6. English (2)

1. Course Name:	English (2)
2. Course Code:	UOW5300
3. Semester / Year:	Master/ First Semester/2025-2026
4. Description Preparation Date:	02/01/2026
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	/
7. Course administrator's name (mention all, if more than one name)	Name: | Assist Prof Dr.Khudhair A. AssafEmail: | kassaf@uowasit.edu.iq
8. Course Objectives	1- Develop the ability to listen, speak, read, and write effectively in English. 2- Enable students to use English effectively in everyday life, professional settings, and academic contexts. 3- Foster knowledge of grammar, vocabulary, pronunciation, and syntax 4- Build confidence in using English through practice and positive reinforcement 5- Prepare students for various English proficiency tests and academic exams.
9. Teaching and Learning Strategies	

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-		Interpreting meaning; recognizing fact and speculation	Unit 6	Lecture-discussion	Quizzes and Tests
2-		Listening for gist (2): recognizing attitudes	Unit 6	Lecture-discussion	Quizzes and Tests
3-		Using original sources: dealing with difficult language and unknow nvocabulary	Unit 7	Lecture-discussion	Quizzes and Tests
4-		Listening for detail (3): phrases which express opinion	Unit 7	Lecture-discussion	Quizzes and Tests

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
5-		Rephrasing and explaining; dealing with difficult scientific and technological words	Unit 8	Lecture-discussion	Quizzes and Tests
6-		Understanding incomplete speech	Unit 8	Lecture-discussion	Quizzes and Tests
7-			Exam		
8-		Linking ideas (4); sequencing words to describe a process	Unit 9	Lecture-discussion	Quizzes and Tests
9-		Supporting an argument: listening for reasons, evidence and examples	Unit 9	Lecture-discussion	Quizzes and Tests
10-		Interpreting data: statistical information in graphs, charts, and texts	Unit 10	Lecture-discussion	Quizzes and Tests
11-		Dealing with longer listenings	Unit 10	Lecture-discussion	Quizzes and Tests
12-		Active and passive voice			Quizzes and Tests
13-		Relative pronouns			Quizzes and Tests
14-					
15-			Exam		

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Headway Academic Skills
	[2] Headway Academic Skills Reading, Writing, and Study Skills
	[3]
	[4]
	[5]
Main references (sources)	[1]

	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1]
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1]
	[2]
	[3]
	[4]
	[5]

5.7. Research Methodology (2)

1. Course Name:	Research Methodology (2)
2. Course Code:	UOW5400
3. Semester / Year:	2025-2026
4. Description Preparation Date:	02/01/2026
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	1
7. Course administrator's name (mention all, if more than one name)	Name: | Assist Prof Dr. Mahdi Ahmed MohammedEmail: | mahmed@uowasit.edu.iq
8. Course Objectives	1- Enable the student to know the principle of scientific research 2- Knowing the purposes of research and its relation to development 3- Knowing the importance of research proposal 4- Enable to write a research proposal 5- Ability to write a literature review 6- Knowing general guidelines for writing a dissertation 7- Ability to write a manuscript
9. Teaching and Learning Strategies	1- Knowing the importance of publishing articles 2- Ability to distinguish types of research 3- Knowing how to write research proposal 4- Knowing how to write dissertations and papers

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	1	Definition of introduction and the fundamentals of research	Introdution of research	Lecture + discussion	Tests
2-	1	Knowing types of knowledge	Types of Knowledge that Research Contributes to Education	Lecture + discussion	Tests
3-	1	Knowing the importance of doing research	Purposes of Research	Lecture + discussion	Tests
4-	1	The relation between the research and development	Research and Development	Lecture + discussion	Tests

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
5-	1	Knowing the advantages of writing a literature review	Literature Survey 1	Lecture + discussion	Tests
6-	1	Tips for writing a literature review	Literature Survey 2	Lecture + discussion	Tests
7-	1	Ability to write a research proposal	HOW TO WRITE A RESEARCH PROPOSAL?	Lecture + discussion	Tests
8-	1	Knowing the methodology of writing a thesis	Methodology of writing a thesis 1	Lecture + discussion	Tests
9-	1	General guidelines for writing thesis/ dissertation	Methodology of writing a thesis 2	Lecture + discussion	Tests
10-	1	Knowing the methodology for writing a research article	Principles of Scientific Writing	Lecture + discussion	Tests
11-	1	Steps to write an abstract of article	Writing an Abstract for Your Research Paper	Lecture + discussion	Tests
12-	1	Ability to choose keywords	Choosing Keywords and roles of writing title	Lecture + discussion	Tests
13-	1	Steps to write an introduction to the article	Writing an Introduction	Lecture + discussion	Tests
14-					
15-					

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.... etc

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1]
	[2]
	[3]
	[4]
	[5]

Main references (sources)	[1] Getu Degu, Tegbar Yigzaw "Research Methodology", University of Gondar, 2006
	[2] Amrita Prayag "Overview and Principles of Scientific Writing", Indian Journal of Medical and Paediatric Oncology, 2019
	[3] F. Ecarnot, M.-F. Seronde, R. Chopard, F. Schiele, N. Meneveau"Writing a scientific article: A step-by-step guide for beginners", European Geriatric Medicine, 2015
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1] Muhammad Sarhan Ali Al-Mahmoudi - Scientific Research Curriculum - 2019
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1]
	[2]
	[3]
	[4]
	[5]