Republic of Iraq
Ministry of Higher Education and Scientific Research
University of Wasit
College of Science – Department of Physics
ACADEMIC PROGRAM AND COURSE DESCRIPTION
Doctor of Philosophy (Ph.D.) in Physics
Academic Year 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

1. Academic Program and Course Description Guide

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 University
Faculty/Institute:	College of Science
Scientific Department:	Department of physics
Academic or Professional Program Name:	Doctoral degree in physics
Final Certificate Name:	Doctor of Philosophy (Ph.D) in physics
Academic System:	Semester: Semester System
Description Preparation Date:	2025-2026
File Completion Date:	

Approvals and Signatures

Signature:

Head of Department Name:

Dr. Najwa Jassim Jubier

Date: 1 / 2 / 2026

Signature:

Head of Department Name:

Najwa Jassim Jubier

Date:

Signature:

Scientific Associate Name:

Dr. Faiq Jameel Hassan

Date: 15 / 2 / 2026

Signature:

Scientific Associate Name:

Date:

2-1 Program Vision

Postgraduate studies (Ph.D.) were opened in the department of physics in the academic year 2016/2017, the vision of the Physics Department in the PhD specialization is toachieve leadership and excellence in physics research by preparing highly qualified researchers capable of producing original scientific knowledge, keeping pace with global scientific developments, and applying physics to serve society and sustainable development.

2-2 Program Mission

Given the central role of physical sciences in all areas of life and across various scientific disciplines, there is an increasing demand for Ph.D. graduates in physics to contribute effectively in both public and private institutions. The Department of Physics is committed to preparing specialized and highly qualified researchers who are capable of conducting independent, rigorous, and original scientific research that advances physical knowledge and addresses both scientific and applied challenges. The department provides a stimulating academic and research environment that fosters creativity, innovation, and adherence to research ethics. It also encourages academic collaboration and engagement with societal needs, in alignment with global scientific developments and the principles of sustainable development.

2-3 Program Objectives

The Department of Physics aims to achieve several key objectives:
1- To produce highly efficient and well-qualified graduates in the field of physics.
2-To equip students with the ability to keep pace with rapid developments in information technology and data analysis.
3-To emphasize the importance of scientific research and its role in serving society through both fundamental and applied studies.
4-To foster continuous performance improvement to ensure comprehensive quality assurance in education and research.

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	15	30		
Summer Training				
Other				

2-7 Program Description

Year/Level	Course Code	Course Name	Credit Hours		
2025-2026			theoretical	practical	tutorial
Semester 1	PHY6101	Advanced Nuclear Physics (2)	3		
Semester 1	PHY6102	Advanced Solid State Physics (2)	3		
Semester 1	PHY6103	Semiconductor	3		
Semester 1	PHY6104	Mathmetical Physics	3		
Semester 1	PHY6105	Computer Programing and Modeling	2		
Semester 1	UOW6100	English Language (3)	1		
Semester 1	UOW6200	Research Methodology (3)	1		
Semester 2	PHY6201	Material Physics	3		

Semester 2	PHY6202	Relativistic Quantum Mechanics	3		
Semester 2	PHY6203	Advanced Plasma Physics (2)	3		
Semester 2	PHY6204	Advanced Optics (2)	3		
Semester 2	PHY6205	Electrodynamics	2		
Semester 2	PHY6206	Special Topic	2		
Semester 2	UOW6300	English Language (4)	1		
Semester 2	UOW6400	Research Methodology(4)	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.7-Developing the ability to conduct original research and publish results in peer-reviewed journals

Skills

1- The student can correctly and safely operate scientific instruments and devices.
2-The student can apply theoretical knowledge effectively in practical and experimental contexts.
3-The student can organize and prepare all necessary materials and resources for experiments and research.
4-The student possesses strong knowledge of physics principles and related scientific disciplines.
5-The student demonstrates technical proficiency and competence in their specialized field.
6-The student has a good command of the English language for scientific communication.
7-The student can perform appropriate procedures to address complex research or experimental situations.
8-The student can design and conduct original, high-quality research projects.
9-The student can analyze data and interpret results using rigorous scientific and statistical methods.
10-The student can manage research projects and supervise academic or research teams effectively.

Ethics

1- Ability to work effectively as part of a team.
2-Adherence to research ethics and publication integrity.
3-Commitment to the ethical standards and regulations of the university.
4-Respect for intellectual property rights and professional academic standards.

2-9 Teaching and Learning Strategies

1- Lectures and Seminars: Deliver core knowledge and theoretical concepts.
2- Active Learning: Classroom discussions, problem-solving, and group projects.
3- Laboratories and Practical Sessions: Connect theory with practical application.
4- Continuous Assessment: Assignments and quizzes to reinforce learning.
5- Blended Learning: Combining face-to-face and digital learning to enhance engagement.
3- Show educational videos during the lecture.

2-10 Evaluation methods

1- Exams.
2-Research reports and academic papers to evaluate analytical and critical thinking skills..
3-Oral presentations and academic discussions to assess communication and defense skills.
4- Comprehensive examinations to assess depth of knowledge in the discipline.
5-Continuous assessment of academic participation and commitment.

2-11 Faculty Members

	Academic Rank	General	Special	Special Requirements/Skills	Staff	Lecturer
1	Prof. Dr. Hashim Ali Yusr	Physics	Materials Physics		Yes	
2	Prof. Dr. Najwa Jassim Jubier	Physics	Materials Physics		Yes	
3	Prof. Dr. Hadi Dwaich Alattabi	Physics	Nuclear Physics		Yes	
4	Prof. Dr. Ahmed Khudhair Abbas	Physics	Plasma Physics		Yes	
5	Prof. Dr. Abbas F. Essa	Physics	Materials Physics		Yes	
6	Prof. Dr. Muneer Hlail Alzubaidy	Physics	Semiconductors		Yes	
7	Assist. Prof . Dr. Ali Kamel Mohsin	Physics	Laser applications		Yes	
8	Assist. Prof. Dr. Mutasim I.Malik	Physics	Remote sensing		Yes	
9	Prof. Dr. Mazin Jasim Mohammed	English	English language			Yes

- **Professional Development**
- **Mentoring new faculty members**

New faculty members are oriented through an institutional induction program that introduces the university's mission and regulations, teaching and assessment policies, and professional ethics. The orientation also includes academic mentoring, training in modern teaching strategies, research support, and continuous professional development to ensure effective integration and high-quality academic performance.

- **Professional development of faculty members**

It includes organized programs and activities designed to update disciplinary knowledge, improve teaching and assessment skills, strengthen research and publication capacities, and develop leadership and

professional skills, thereby ensuring the quality of higher education, research, and community service and 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

1- Hold an accredited university degree in the relevant field or a related discipline.
2- Meet the minimum cumulative GPA required by the department and faculty.
3- Pass the entrance exam or academic interview.
4- Demonstrate the required language proficiency for study and research.
5- Provide academic recommendations and a suitable academic record.
6- Comply with the university's approved graduate studies regulations and policies.

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 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, among these plans:-

1- Review program objectives and learning outcomes to ensure alignment with international standards.
2- Update course content to enhance independent research and critical thinking.
3- Adopt modern teaching methods such as active learning and research-based learning.
4- Improve assessment methods in line with learning outcomes (research, presentations, publications).
5- Support faculty and students through training and academic mentoring.
6- Ensure quality through feedback collection and regular program reviews.

3. Program Skills Outline

				Required program Learning outcomes											
				Knowledge				Skills				Ethics			
Semester	Course Code	Course Name	Basic or optional	A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
Semester 1	PHY6101	Advanced Nuclear Physics (2)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	PHY6102	Advanced Solid State Physics (2)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	PHY6103	Semiconductor	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	PHY6104	Mathmetical Physics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	PHY6105	Computer Programing and Modeling	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	UOW6100	English Language (3)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 1	UOW6200	Research Methodology (3)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY6201	Material Physics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY6202	Relativistic Quantum Mechanics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY6203	Advanced Plasma Physics (2)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY6204	Advanced Optics (2)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY6205	Electrodynamics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	PHY6206	Special Topic	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	UOW6300	English Language (4)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Semester 2	UOW6400	Research Methodology(4)	Basic	√	√	√	√	√	√	√	√	√	√	√	√

4. Course Descriptions – Semester 1

4.1. Advanced nuclear physics (2)

1. Course Name:	Advanced nuclear physics (2)
2. Course Code:	PHY6101
3. Semester / Year:	First Semester/ 2025-2026
4. Description Preparation Date:	01/09/2025
5. Available Attendance Forms:	Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours (3 hours per week) / 3 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof.Dr. Hadi Dwaich Alattabi Email: | 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-	3	Calculte the nuclear binding energy of deuteron	Ground state of the deutron	Theoretical	Exams, report and seminar
2-	3	Review of yukawa andwood-saxon potential	Two nucleon potentials	Theoretical	Exams, report and seminar
3-	3	To knowidgledge the equation of two nucleon potential and the figures in physics	A) Rectangular potential B) Expontial well. C) Yukawa well. D) Woods. Saxon well.	Theoretical	Exams, report and seminar

4-	3	To under stand the mothed to solution	Wave equation for the deuteron and its solutions	Theoretical	Exams, report and seminar
5-	3	To understand the mothed to solution by schroding equation	Wave equation for the deuteron and its solutions	Theoretical	Exams, report and seminar
6-	3	To study the excited state	Excited state of the deutron	Theoretical	Exams, report and seminar
7-	3	To learn the sstyle for normalize wave eqution by Q.M.	Eormalization of the deutron wave equation	Theoretical	Exams, report and seminar
8-	3	To learn the sstyle for normalize wave eqution by Q.M.	Radius of the deutron	Theoretical	Exams, report and seminar
9-	3	To learn and understand of the differentiation cross section of scattering	Low energy neutron proton scattering	Theoretical	Exams, report and seminar
10-	3	To learn and understand of the differentiation cross section of scattering	Limits of energy for the scattering of different partial waves	Theoretical	Exams, report and seminar
11-	3	Use the model to calculate phase shift and scattering length	Phase shift	Theoretical	Exams, report and seminar
12-	3	Use the model to calculate phase shift and scattering length	Scattering length	Theoretical	Exams, report and seminar
13-	3	Use the concepts in physic to solution at low energy	Solution of the radial equation at low energy	Theoretical	Exams, report and seminar
14-	3	Use the concepts in physic to solution of zero energy	Solutions for the neutron of zero energy	Theoretical	Exams, report and seminar
15-	3	Disscusion the wave functions	Nature of the wave functions	Theoretical	Exams, report and seminar

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] nuclear physics S.N. GHOSHAL
	[2] Introdution to nuclear physics HARALD A. ENGE
	[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]

4.2. Advanced Solid State Physics (2)

1. Course Name:	Advanced Solid State Physics (2)
2. Course Code:	PHY6102
3. Semester / Year:	First Semester/ 2025-2026
4. Description Preparation Date:	01/09/2025
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours (3 hours per week) / 3 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr. Abbas F. Essa 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- To distinguish between Dielectric and electric materials.
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-	3	Introduction to solid state physics	Introduction to Solid state Physics	Lecture and discussion	Exams, report and seminar
2-	3	Motivations for Special Relativity, Lorentz transformations	Energy band theory of Solid	Lecture and discussion	Exams, report and seminar
3-	3	Understand The Bloch Theorm	Bloch Theorm	Lecture and discussion	Exams, report and seminar
4-	3	To know the Nearly Free Electron Model (NFE) .	Nearly Free Electron Model (NFE)	Lecture and discussion	Exams, report and seminar
5-	3	Understand Electron Dynamics in the Lattice	Electron Dynamics in the Lattice	Lecture and discussion	Exams, report and seminar

6-	3	Understand the Construction of the Fermi surface	Construction of the Fermi surface	Lecture and discussion	Exams, report and seminar
7-	3	Understand the Anomalous Skin Effect	Anomalous Skin Effect	Lecture and discussion	Exams, report and seminar
8-	3	Derivative the Cyclotron Resonance	Cyclotron Resonance	Lecture and discussion	Exams, report and seminar
9-	3	Understand the De HAAS-Van Alphen effect	De HAAS-Van Alphen effect	Lecture and discussion	Exams, report and seminar
10-	3	Define the polarazation and know the types of polarization	Polarization	Lecture and discussion	Exams, report and seminar
11-	3	Define the Dielectric properties	Dielectric	Lecture and discussion	Exams, report and seminar
12-	3	Understand the Dielectric Relaxation in Solids	Dielectric Relaxation in Solids	Lecture and discussion	Exams, report and seminar
13-	3	Study the Ferroelectric Hysteresis	Ferroelectric Hysteresis	Lecture and discussion	Exams, report and seminar
14-	3	Study the Magnetic Properties of Materials	Magnetic Properties of Materials	Lecture and discussion	Exams, report and seminar
15-	3		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]
	[2]
	[3]
	[4]
	[5]
Main references (sources)	[1] kittle,"solid state physics" 8th edition.
	[2] Blackmore,"solid state physics" 8th edition.
	[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]

4.3. Semiconductor

1. Course Name:	Semiconductor
2. Course Code:	PHY6103
3. Semester / Year:	First Semester/ 2025-2026
4. Description Preparation Date:	01/09/2025
5. Available Attendance Forms:	actual attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours (3 hours per week) / 3 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr Muneer Hlail Alzubaidy Email: | malzubaidy@uowasit.edu.iq
8. Course Objectives	1- To import knowledge about crystals. 2- Give student knowledge about carriers in Semiconductors. 3- Study the bands theory of Semiconductors. 4- Study the conductivity of Semiconductors. 5- To import knowledge about free electron. 6- Study the optical Properties of Semiconductors. 7- Study the Semiconductor electrostatics. 8- Study the model of electron conduction. 9- To import knowledge about Quantum conductance. 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-	3	Crystals: Structure and Growth. Energy Bands	Crystals	Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.

2-	3	Carriers in Semiconductors	Carriers	Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
3-	3	Phonon Spectra and Optical Properties of Semiconductors Interband, intraband, excitonic and phonon optical transitions.	Optical properties of semiconductor	Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
4-	3	Review Maxwell equations.		Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
5-	3	The semiconductor laser. Influence of electron and photon quantization on static and dynamic behavior of scaled laser diodes and photon statistics.	Laser diodes	Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
6-	3	Activity and discussion.		Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.

7-	3	Failure of the nonequilibrium phase-transition description of laser light emission.		Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
8-	3	Semiconductor electrostatics: the Poisson-Boltzmann equation; accumulation, flat-band, inversion, and depletion regimes; approximate solutions; capacitance; applications to p-n junctions, Schottky diodes, and MOS capacitors.	Semiconductor electrostatics	Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
9-	3	Semiconductor nanostructures, including technology and optical properties of quantum dots.	Nanostructures	Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
10-	3	Plasmonics of thin metallic layers and nanoparticles.		Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.

11-	3	Metal - Semiconductor junction.		Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
12-	3	PNPN diode or shockley diode.		Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
13-	3	IMPATT.		Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
14-	3	Quantum semiconductors- Quantum dots.		Lecture	Continuous assessment, including class participation, oral presentationsand a final written examination.
15-	3	Exam		Lecture	Continuous assessment, including class participation, oral presentationsand a final written 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.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Advanced Semiconductor Fundamentals 2nd Edition ,Robert Pierret
	[2]
	[3]
	[4]
	[5]
Main references (sources)	[1] Solid state physics electronics series , Nick Holonyak
	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1]
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1] Physics of Semiconductor Devices, 4th Edition Simon M. Sze, Yiming Li, Kwok K. Ng
	[2] Principles of Semiconductor Devices , B. Van Zeghbroeck, 2011https://www.eletrica.ufpr.br/graduacao/e-books/Principles%20Of%20Semiconductor%20Devices.pdf
	[3]
	[4]
	[5]

4.4. Mathematical Physics

1. Course Name:	Mathematical Physics
2. Course Code:	PHY6104
3. Semester / Year:	First Semester/ 2025-2026
4. Description Preparation Date:	01/09/2025
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours (3 hours per week) / 3 units
7. Course administrator's name (mention all, if more than one name)	Name: Prof Dr. Ahmed Khudhair Abbas Email: aalzubaidi@uowasit.edu.iq
8. Course Objectives	1- Qualifying and training the student and teaching him the advanced state of Mathematical Physics. 2- Qualifying and training the student and teaching him the importance of Vector space and transformations. 3- Qualifying and training the student and teaching him the different ways to solve problems regarding matrices and advanced methods of numerical integrations and differentiations.
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	6	Vector space and transformations, Linear independence of vectors, Linear transformations, The inverse of linear transformations	Vectors and Matrices	Explanation + discussion	Daily and monthly exams and group discussions

3+4+5+6+7	15	The algebra of matrices, Zero matrix- matrix addition- matrix multiplications, The commutator, Complex conjugate, Square matrix- unitary matrix- Hermitian matrix- triangular matrix, Trace of matrix, Determinant, The inverse matrix, orthogonal matrix, unitary matrix, similar matrices, unitary equivalent matrices	Matrices and linear transformations	Explanation + discussion	Daily and monthly exams and group discussions
8+9+10	9	Eigenvalues and Eigenvectors, Relating Eigenvalues and Eigenvectors with physical phenomena, Diagonalization of matrices	Orthogonal and unitary transformations	Explanation + discussion	Daily and monthly exams and group discussions
11+12+13+14+15	15	Newton - Raphson method 1st order , Newton - Raphson method 2nd order, Numerical integrations and differentiations: Simpson's rule, Trapezoid's method, forward difference, finite difference, central difference.	Numerical analysis	Explanation + discussion	Daily and monthly exams and group discussions
Course Evaluation					

11. Course Evaluation

Learning and Teaching Resources

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Arfken, Weber and Harris, Mathematical methods for Physicists.
	[2] G Farkhad, Mathematical Methods for Physics: Problems and Solutions, 2023.

	[3] G. Strang, introduction to linear algebra, 2023.
Main references (sources)	[1] Eugene Butkov, Mathematical Physics.
	[2] Susan Lea, Mathematics for Physicists Physicists", Academic.
	[3] Whittaker and Watson, A course of modern analysis.
Recommended books and references (scientific journals, reports...)	[1] Journal of communications and Mathematical Physics.
	[2] Journal of Mathematical Physics.
	[3] Journal of Physics A: Mathematical and Theoretical.
	[4] Reviews in Mathematical Physics.
Electronic References, Websites	[1] http://chi.physics.sunysb.edu/lectures/fall 2020/phy503/notes/notes.shtml.
	[2]https://bingweb.binghamton.edu/~suzuki/MathPhysics.html.
	[3]https://people.uncw.edu/hermanr/phy311/MathPhysBook/index.htm.

4.5. Compter Programing and Modeling

1. Course Name:	Compter Programing and Modeling
2. Course Code:	PHY6105
3. Semester / Year:	First Semester/ 2025-2026
4. Description Preparation Date:	01/09/2025
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	30 hours (2 hours per week) / 2 units
7. Course administrator's name (mention all, if more than one name)	Name: | Assist. Prof . Dr. Mutasim I.Malik Email: | mutasim@uowasit.edu.iq
8. Course Objectives	1- To impart knowledge about various modeling tools employed to study problems in physics. 2- Enabling the student to acquire basic skills. 3- Make the students familiar with the modeling concepts that used frequently in physics. 4- Enhance students' ability in understand modeling problems. 5- To increase the students' background about foundations and concepts of modeling. 6- Enable the student to employ the modeling for the purposes of academic study and research. 7- Enable the students to build program to describe the physical laws and physical phenomena.
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	1D,2D,3D functions	introduction mathematical function	Lecture based instruction, includes program	Assignment
2-	2	Gausian,sin,cos,exponential and parabola functions		Lecture based instruction, includes program	

3-	2	Gausian, binomialand pission distributions	Distributions	Lecture based instruction, includes program	Assignment
4-	2	Fourier transformation in 1D and 2D	Fourier optics	Lecture based instruction, includes program	Assignment
5-	2	Lens and telescope design as FT	Telescope designing	Lecture based instruction, includes program	
6-	2	Dirac-delta finction as FT		Lecture based instruction, includes program	
7-	2	Transfer function (OTF&MTF)		Lecture based instruction, includes program	
8-	2	Astronomical seeing	Astronomical seeing	instruction, includes program	
9-	2	effects of atmospher trublent on telescope images		Lecture based instruction, includes program	
10-	2	FT for Gaussian wave Diameter		Lecture based instruction, includes program	
11-	2	FT in diffraction	Diffraction theory	Lecture based instruction, includes program	
12-	2	Convolution and correlation	Convolution and correlation theroy and applications	Lecture based instruction, includes program	
13-	2	1D regression and 2D regressiion	Regression	Lecture based instruction, includes program	Assignment

14-	2	Curve fitting, least square method(linear, exponential and parabola)	Curve fitting	Lecture based instruction, includes program	
15-	2	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] Physical modeling in matlab by Allen B. Downey version 4.0.
	[2]
	[3]
	[4]
	[5]
Main references (sources)	[1] AN INTRODUCTION TO MATHEMATICAL MODELING, Edward A. Bender University of California, San Diego.
	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1] Applied computational modeling with matlab , yucang wang, william W. Guo,2018.
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1] https://greenteapress.com/wp/physical-modeling-in-matlab/
	[2] https://link.springer.com/book/10.1007/978-3-030-79717-1
	[3]
	[4]
	[5]

4.6. English Language (3)

1. Course Name:	English Language (3)
2. Course Code:	UOW6100
3. Semester / Year: Semester	First Semester/ 2025-2026
4. Description Preparation Date:	01/09/2025
5. Available Attendance Forms:	In-Class Lectures
6. Number of Credit Hours (Total) / Number of Units (Total) : units	15 hours (1 hours per week) / 1 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr. Mazin Jasim Mohammed Email: | malhilu@uowasit.edu.iq
8. Course Objectives	1- Familiarizing PhD students with basic language skills required for their study. 2- Introducing them to the proper use of English language in terms of types of sentences and other basic structures in English. 3- Increasing PhD students' knowledge in the skills of reading and writing. 4- Exposing PhD students to real-life situations in English to foster the approporiate use of different grammatical structures to cope with such situations.
9. Teaching and Learning Strategies	1- In-class lectures. 2- Power point presentations. 3- Class discussions.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	2	Understanding Parts of Speech	Unit One	lecture	Assignment
2-	2	Getting to know types of Effecting Reading	Unit One	lecture	Assignment
3-	2	Explaining Comparing and Contrasting	Unit One	lecture	Assignment / Quiz
4-	2	Reading Passage	Unit Two	lecture	Assignment
5-	2	Developing Writing Skill	Unit Two	lecture	Assignment / Quiz

6-	2	Developing Vocabulary	Unit Two	lecture	Assignment
Mid-Term	2	Writing a Paragraph	Unit Two	lecture	Assignment
8-		Mid - Term Exam			
9-	2	Text Cohesion	Unit Three	lecture	Assignment
10-	2	Selecting Information from the Internet	Unit Three	lecture	Assignment
11-	2	Reading Passage + Collocation	Unit Three	lecture	Quiz
12-	2	Introduction and Conclusion	Unit Four	lecture	Assignment
13-	2	How to describe and Explain	Unit Four	lecture	Assignment
14-	2	Reviewing Basics of Writing + Using a Dictionary	Unit Five	lecture	Assignment
15-		Final 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 (40 Ms) average distributed as follows: (20 Ms mid-Term exam); (10 Ms Assignments); (10 Ms Class attaindance and participation);

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Headway: Academic Skills - Level 3
	[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] Net Sources
	[2]
	[3]
	[4]
	[5]

4.7. Research Methodology (3)

1. Course Name:	Research Methodology (3)
2. Course Code:	UOW6200
3. Semester / Year:	First Semester/ 2025-2026
4. Description Preparation Date:	01/09/2025
5. Available Attendance Forms:	Actual Mandatory Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	15 hours (1 hours per week) / 1 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr Najwa Jassim Jubier Email: | njassim@uowasit.edu.iq

8. Course Objectives	1- Introducing doctoral students to the fundamental concepts and principles of scientific research and its importance. 2- Developing students' understanding of different types of scientific research and their methodologies. 3- Enabling students to identify, formulate, and develop original research problems and questions. Inhancing students' ability to critically review and evaluate scientific literature. 5- Familiarizing students with the basic structure and components of a scientific research paper. 6- Developing essential academic and scientific writing skills. Promoting awareness of research ethics, academic integrity, and responsible research conduct. 7- Promoting awareness of research ethics, academic integrity, and responsible research conduct. 8- Preparing students to design rigorous and systematic research studies.
9. Teaching and Learning Strategies	1- Adopting the discussion method 2- Using the interactive way of learning 3- Research groups - nested discussion circles. 4- Making the students involved in various activities 5- Selected case studies from published research are studied to illustrate good research design, methodological rigor, and ethical research practices.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	1	Students will understand the conceptof scientific research and its role in knowledge development.	General introduction and the concept of scientific research	Theoretical instruction, supported by guided discussions and critical reading.	Continuous assessment, including class participation, oral presentations, a midterm, and a final written examination.

2-	1	Students will recognize the importance of scientific research in advancing knowledge, solving real-world problems, and supporting academic and societal development.	The importance of scientific research	Theoretical instruction, supported by guided discussions and critical reading.	
3-	1	Tudents will be able to identify, explain, and analyze the main objectives of scientific research and their role in advancing scientific knowledge and addressing societal and academic needs.	The objectives of scientific research	Theoretical instruction, supported by guided discussions and critical reading.	
4-	1	Students will be able to describe and evaluate the key characteristics of scientific research, including objectivity, systematic approach, reliability, validity, and ethical conduct.	The characteristics of scientific research	Theoretical instruction, supported by guided discussions and critical reading.	
5-	1	Students will be able to identify, formulate, and clearly define a research problem based on critical analysis of scientific literature and research gaps.	Defining the research problem	Theoretical instruction, supported by guided discussions and critical reading.	
6-	1	Students will be able to classify and explain the main types of scientific research and scientific publishing, and distinguish between their purposes, methodologies, and applications.	Types of scientific research and Scientific Publishing	Theoretical instruction, supported by guided discussions and critical reading.	

7-	1	Students will be able to identify the basic parts of a scientific research paper and recognize common mistakes in scientific research writing in order to avoid them.	Basic parts of the research,Common mistakes when writing scientific research	Theoretical instruction, supported by guided discussions and critical reading.	
8-	1	Midterm Exam			
9-	1	Students will be able to identify high-impact journal criteria, apply manuscript preparation best practices, adhere to publishing ethics, navigate the peer review process, enhance research visibility, and critically evaluate published papers."	Criteria for Publishing Scientific Paper in a "High-Impact" Journal	Theoretical instruction, supported by guided discussions and critical reading.	
10-	1	Students will be able to recognize the features of reputable scientific journals	Characteristics of reputable scientific journals	Exam	
11-	1	Students will be able to identify unethical practices of predatory journals	Strange practices by irresponsible magazines	Theoretical instruction, supported by guided discussions and critical reading	
12-	1	Students will be able to define, calculate, and interpret impact factor and h-index, understand their significance and limitations, and apply them to evaluate journals and scholarly research."	Impact Factor, H-index	Theoretical instruction, supported by guided discussions and critical reading	

13-	1	Students will be able to navigate the manuscript submission process, understand peer review, and respond effectively to reviewers' comments to enhance publication success."	Article Submission,Response to Review Comment	Theoretical instruction, supported by guided discussions and critical reading	
14-	1	Students will be able to identify major challenges in scientific publishing, understand their impact, and apply strategies to overcome them effectively."	The most significant obstacles to scientific publishing / the most significant challenges	Theoretical instruction, supported by guided discussions and critical reading	
15-	1	Finel Exam			

11. Course Evaluation

The final exam is worth 60% of the total grade, and the remaining 40% is divided as follows: 30% for tests, 10% for participation, activities, and seminars.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] There are no systematic references at present
	[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] There are many solid sites on the subject
	[2]
	[3]
	[4]
	[5]

5. Course Descriptions – Semester 2

5.1. Material Physics

1. Course Name:	Material Physics
2. Course Code:	PHY6201
3. Semester / Year:	2nd semester 2025-2026
4. Description Preparation Date:	01/02/2026
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours (3 hours per week) / 3 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr. Abbas F. Essa Email: | afadhel@uowasit.edu.iq
8. Course Objectives	
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-	3	Introductionof alloys	Classification of Metals alloys	Lecture and discussion	Exams, report and seminar
2-	3	Define the metal and non metal materials	Metals and Non Metals	Lecture and discussion	Exams, report and seminar
3-	3	Understand thetypes of alloys such as steel alloys	Steel Alloys	Lecture and discussion	Exams, report and seminar
4-	3	Show the types of Iron	Cast Iron Types	Lecture and discussion	Exams, report and seminar
5-	3	Defining momentum in Special Relativity, Defining relativistic energy	Non-Ferrous Metals	Lecture and discussion	Exams, report and seminar
6-	3	Define the Corrosion in Materials	Corrosion in Materials	Lecture and discussion	Exams, report and seminar

7-	3	Explan the Types of Corrosion	Types of Corrosion	Lecture and discussion	Exams, report and seminar
8-	3	Introductionof polymers	Polymers	Lecture and discussion	Exams, report and seminar
9-	3	Classification of Polymers and its applications in materials	Classification of Polymers	Lecture and discussion	Exams, report and seminar
10-	3	Define the polymerization of polymers and its types.	Polymerization Reaction	Lecture and discussion	Exams, report and seminar
11-	3	Define the Composite Materials,types of composite materials and its applications	Composite Materials	Lecture and discussion	Exams, report and seminar
12-	3	Explian the Modulus of Elasticity and show the modulus constant of some materials	Modulus of Elasticity	Lecture and discussion	Exams, report and seminar
13-	3	Explian the Ceramic Materials	Ceramic Materials	Lecture and discussion	Exams, report and seminar
14-	3	Define the Ceramic Processing	Ceramic Processing	Lecture and discussion	Exams, report and seminar
15-	3		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]
	[2]
	[3]
	[4]
	[5]
Main references (sources)	[1] Van vlack ,"Element of Material science and engineering" 6th edition
	[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]

5.2. Relativistic Quantum Mechanics

1. Course Name:	Relativistic Quantum Mechanics
2. Course Code:	PHY6202
3. Semester / Year:	2nd semester 2025-2026
4. Description Preparation Date:	01/02/2026
5. Available Attendance Forms:	Actual Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours (3 hours per week) /3 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof.Dr. Hadi Dwaich Alattabi Email: | alattabih@uowasit.edu.iq
8. Course Objectives	1- Understanding, and developing appropriate solutions for physical systems whose particles have speeds close to the speed of light. 2- Using a four-dimensional space such as Murkowski space within the concept of space-time.
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-	3	To interst the math. Of tensor notation in laws of physics must be same in all cordinate	Tensor notations	Theoretical	
2-	3	To knowledge the summtry	The lorentz group	Theoretical	
3-	3	To knowledge the summtry of space and time in nature	The lorentz group	Theoretical	
4-	3	Reivew of concepis in R.Q.M	Concepts in R.Q.M.	Theoretical	
5-	3	To understand the vector in four dimention	Minkowsiki space	Theoretical	

6-	3	To learn the concedance operator in Q.M	derivative the Minkowsiki matrix	Theoretical	
7-	3	To knowlge the limit of plank time	Calculate the plank time and derivative for this time	Theoretical	
8-	3	To meaning speacetime in physics	Spacetime concepts in physics	Theoretical	
9-	3	To solution the K.G equation	The klein-Gordon equation	Theoretical	
10-	3	To solution the K.G equation	The klein-Gordon equation	Theoretical	
11-	3	To solution the D.E for spinless	The Dirac equation	Theoretical	
12-	3	To solution the D.E for mass equal zero	The Dirac equation	Theoretical	
13-	3	To understand the cocepts of dalmrat operator	Specific representation of D.E.by four solution	Theoretical	
14-	3	To learn the concedance operator in Q.M	Non relativistic correspondence	Theoretical	
15-	3	To evalute and converl in analysic model	Use dimensional analysis model	Theoretical	

11. Course Evaluation

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Relativistic quantum mehanics I.J.R AITCHISON
	[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]

5.3. Advanced Plasma Physics

1. Course Name:	Advanced Plasma Physics
2. Course Code:	PHY6203
3. Semester / Year:	2nd semester 2025-2026
4. Description Preparation Date:	01/02/2026
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours (3 hours per week) / 3 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof Dr. Ahmed Khudhair Abbas Email: | aalzubaidi@uowasit.edu.iq
8. Course Objectives	1- • Qualifying and training the student and teaching him the advanced state of Plasma Physics. 2- • Qualifying and training the student and teaching him the importance of Kinetic theory using Vlasov and Boltzmann equations. 3- • Qualifying and training the student and teaching him the behavior of Plasma as fluid and as waves in different forms and phenomena.
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	6	Particle phase space, Velocity distribution function, Phase space evolution, and Collisional Boltzmann and Vlasov equations	Kinetic theory	Explanation + discussion	Daily and monthly exams and group discussions
3+4+5	9	Cold- Plasma model, Warm- Plasma model, Complete set of two-fluid equations, Fluids drifts perpendicular to B, and Fluids drifts parallel to B	Fluid approach to Plasmas	Explanation + discussion	Daily and monthly exams and group discussions

6+7	6	• Single-fluid theory for fully ionized Plasma • MHD mass and charge conservation • MHD equation of motion • Generalized Ohm's law • Simplified MHD equations	Single-Fluid theory MHD	Explanation + discussion	Daily and monthly exams and group discussions
8+9+10+11	12	• Magnetic forces • Magnetic pressure and tension • Solar and stellar MHD • Scale heights in coronal loops • Solar Plasma properties • Coronal magnetostatics • Force-free fields • Linear Force-free fields • Nonlinear Force-free fields	MHD equilibria and applications	Explanation + discussion	Daily and monthly exams and group discussions
12+13+14+15	12	• Simple wave presentation • Wave group speed • Fluid equations I • Expanded equation of motion • Fluid equations II • Modified energy equation • Wave perturbations • MHD linearization (continuity equation) • MHD linearization (equation of motion) • MHD linearization (energy/ induction eqns.) • MHD linearization (gas law/	Waves in Plasmas	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] T.J.M. Boyd, The Physics of Plasmas
	[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] شعيب يوسف.د ,والهندسة العلوم لطلبة وتطبيقاتها البلازما فيزياء محمد
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/

5.4. Advanced Optics

1. Course Name:	Advanced Optics
2. Course Code:	PHY6204
3. Semester / Year:	2nd semester 2025-2026
4. Description Preparation Date:	01/02/2026
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	45 hours (3 hours per week) / 3 units
7. Course administrator's name (mention all, if more than one name)	Name: | Assist profesor Dr. Ali Kamel Mohsin Email: | aalbedary@uowasit.edu.iq

8. Course Objectives	1- Analyze the fundamental principles of linear optics, including wave propagation and classical light–matter interaction. 2- Apply advanced theoretical and mathematical models to solve research-level problems in linear optical systems 3- Explain and evaluate the physical mechanisms of nonlinear optical phenomena and their applications in modern photonic and laser systems. 4- Analyze nonlinear optical materials and processes relevant to advanced scientific and technological applications. 5- Explain the core concepts of quantum optics, including photon behavior, field quantization, and quantum light–matter interaction. 6- Integrate linear, nonlinear, and quantum optics concepts to support independent research and advanced doctoral studies in optics and photonics.
9. Teaching and Learning Strategies	1- Advanced Theoretical Lectures. Used to develop students' ability to derive, analyze, and explain linear, nonlinear, and quantum optical principles. 2- Problem-Based and Analytical Exercises. Focused on solving advanced optical problems to enhance skills in modeling, quantitative analysis, and critical reasoning. 3- Research Seminars and Student Presentations. Engage students in reviewing and presenting current scientific literature to strengthen evaluation, synthesis, and scientific communication skills. 4- Independent Research and Self-Directed Learning Encourages students to integrate concepts across linear, nonlinear, and quantum optics in doctoral-level research contexts. 5- Group and individual reports.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	3	Introduction to Advanced Optics and Review of Classical Electromagnetic Theory	Chapter 1	Explanation + discussion	Daily and monthly exams and group discussions.
2-	3	Wave Propagation in Optical Media and Maxwell's Equations in Linear Media	Chapter 1	Explanation + discussion	Daily and monthly exams and group discussions.

3-	3	Polarization, Anisotropic Media, and Jones & Mueller Matrix Formalism	Chapter 1	Explanation + discussion	Daily and monthly exams and group discussions.
4-	3	Interference, Diffraction, and Fourier Optics	Chapter 1	Explanation + discussion	Daily and monthly exams and group discussions.
5-	3	Advanced Light–Matter Interaction and Linear Optical Response of Materials	Chapter 1	Explanation + discussion	Daily and monthly exams and group discussions.
6-	3	Introduction to Nonlinear Optics and Nonlinear Polarization Theory	Chapter 2	Explanation + discussion	Daily and monthly exams and group discussions.
7-	3	Midterm Exam			
8-	3	Second-Order Nonlinear Effects: SHG, SFG, DFG, and Phase Matching, Third-Order Nonlinear Effects: Kerr Effect, Self-Phase Modulation, and Four-Wave Mixing	Chapter 2	Explanation + discussion	Daily and monthly exams and group discussions.
9-	3	Nonlinear Optical Materials and Applications in Lasers and Photonics	Chapter 2	Explanation + discussion	Daily and monthly exams and group discussions.
10-	3	Introduction to Quantum Optics and Quantization of the Electromagnetic Field	Chapter 3	Explanation + discussion	Daily and monthly exams and group discussions.
11-	3	Interaction of an atom with the quantized electromagnetic field	Chapter 3	Explanation + discussion	Daily and monthly exams and group discussions.
12-	3	Photon Statistics, Coherent and Squeezed States of Light	Chapter 3	Explanation + discussion	Daily and monthly exams and group discussions.
13-	3	Quantum Light–Matter Interaction and Two-Level Atomic Systems	Chapter 3	Explanation + discussion	Daily and monthly exams and group discussions.

14-	3	Advanced Topics, Student Seminars, and Integration of Linear, Nonlinear, and Quantum Optics Concepts	Chapter 3	Explanation + discussion	Daily and monthly exams and group discussions.
15-		Finel Exam			

11. Course Evaluation

Grade Distribution : The total course grade is distributed out of 100 marks based on the following assessment components:
Final Examination: The final written examination accounts for 60% of the total course grade and assesses comprehensive understanding of the course content.
Continuous Assessment (40%): The remaining 40% of the total grade is allocated to continuous assessment activities, which include: Two written examinations (midterm or monthly exams), Daily preparation and oral participation, Assignments, reports, and seminars, designed to evaluate students' ongoing engagement, analytical skills, and research-oriented performance throughout the course.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Boyd, R. W. Nonlinear Optics, 3rd Edition, Academic Press, 2008.
	[2] Saleh, B. E. A., & Teich, M. C. Fundamentals of Photonics, 2nd Edition, Wiley-Interscience, 2007.
	[3] Gerry, C. C., & Knight, P. L. Introductory Quantum Optics, Cambridge University Press, 2005.
	[4]
	[5]
Main references (sources)	[1] Hecht, E. Optics, 5th Edition, Pearson, 2017.
	[2]
	[3]
	[4]
	[5]
Recommended books and references (scientific journals, reports...)	[1] Scully, M. O., & Zubairy, M. S. Quantum Optics, Cambridge University Press, 1997.
	[2]
	[3]
	[4]
	[5]
Electronic References, Websites	[1] OSA Publishing – The Optical Society https://www.osapublishing.org

	[2]SPIE Digital Library https://www.spiedigitallibrary.org
	[3] Quantum Optics Online Resources http://www.quantum-optics.org
	[4]
	[5]

5.5. Eelectrodynamics

1. Course Name:	Eelectrodynamics
2. Course Code:	PHY6205
3. Semester / Year:	2nd semester 2025-2026
4. Description Preparation Date:	01/02/2026
5. Available Attendance Forms:	Actual mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	30 hours (2 hours per week) / 2 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr. Hashim Ali Yusr Email: | hashim@uowasit.edu.iq
8. Course Objectives	1- Demonstrate a rigorous understanding of special relativity, including Einstein's postulates, spacetime structure, and Lorentz transformations, and their role in modern physics. 2- Apply relativistic mechanics, incorporating proper time, relativistic kinematics and dynamics, and the concepts of relativistic energy and momentum. 3- Formulate electrodynamics in a covariant framework, using four-vectors, tensor notation, and the electromagnetic field tensor to express Maxwell's equations. 4- Analyze electromagnetic potentials and gauge freedom, including the four-potential, gauge transformations, Coulomb and Lorenz gauges, and retarded potentials 5- Solve advanced relativistic electrodynamics problems, involving moving charges, continuous charge and current distributions, radiation phenomena, and Jefimenko's equations.
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	The Special Theory of Relativity , Einstein's Postulates	Electrodynamics and Relativity	lecture-based instruction	
2-	2	The Galilean Transformations , The Lorentz Transformations	Electrodynamics and Relativity	lecture-based instruction	Assignment
3-	2	Relativistic Mechanics , Proper Time and Proper Velocity , Relativistic Energy and Momentum	Electrodynamics and Relativity	lecture-based instruction	
4-	2	Relativistic Kinematics , Relativistic Dynamics	Electrodynamics and Relativity	lecture-based instruction	Assignment
5-	2	Relativistic Electrodynamics , Magnetism as a Relativistic Phenomenon	Electrodynamics and Relativity	lecture-based instruction	
6-	2	How the Fields Transform , The Field Tensor	Electrodynamics and Relativity	lecture-based instruction	Assignment
7-	2	Electrodynamics in Tensor Notation	Electrodynamics and Relativity	lecture-based instruction	
8-	2	Relativistic Potentials	Electrodynamics and Relativity	lecture-based instruction	Assignment
9-	2	Scalar and Vector Potentials	Potentials and Fields	lecture-based instruction	
10-	2	Gauge Transformations	Potentials and Fields	lecture-based instruction	Assignment
11-	2	Coulomb Gauge and Lorenz Gauge	Potentials and Fields	lecture-based instruction	
12-	2	Lorentz Force Law in Potential Form	Potentials and Fields	lecture-based instruction	Assignment
13-	2	Retarded Potentials	Potentials and Fields	lecture-based instruction	
14-	2	Jefimenko's Equations	Potentials and Fields	lecture-based instruction	Assignment
15-	2	The Liénard-Wiechert potentials	Potentials and Fields	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] D.J. Griffiths, Introduction to Electrodynamics, Cambridge University Press (2017)
	[2] Thidé, Bo. Electromagnetic Field Theory. Uppsala: Uppsala University,(2000).
	[3] J.J. Jackson, Classical electrodynamics, John Wiley & Sons (1999)
	[4]
	[5]
Main references (sources)	[1] D.J. Griffiths, Introduction to Electrodynamics, Cambridge University Press (2017)
	[2] Thidé, Bo. Electromagnetic Field Theory. Uppsala: Uppsala University,(2000).
	[3] J.J. Jackson, Classical electrodynamics, John Wiley & Sons (1999)
	[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]

5.6. English Language (4)

1. Course Name:	English Language(4)
2. Course Code:	UOW6300
3. Semester / Year: Semester	2nd semester 2025-2026
4. Description Preparation Date:	01/02/2026
5. Available Attendance Forms:	In-Class Lectures
6. Number of Credit Hours (Total) / Number of Units (Total) :	15 hours (1 hours per week) / 1 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr. Mazin Jasim Mohammed Email: | malhilu@uowasit.edu.iq
8. Course Objectives	1- Familiarizing PhD students with basic language skills required for their study. 2- Introducing them to the proper use of English language in terms of types of sentences and other basic structures in English. 3- Increasing PhD students' knowledge in the skills of reading and writing. 4- Exposing PhD students to real-life situations in English to foster the approporiate use of different grammatical structures to cope with such situations.
9. Teaching and Learning Strategies	1- In-class lectures 2- Power point presentations 3- Class discussions

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-	2	Dealing with longer texts	Unit Six	lecture	Assignment
2-	2	Checking Writing	Unit Six	lecture	Assignment
3-	2	Explaining reason or result	Unit Six	lecture	Assignment / Quiz
4-	2	Reading Passage	Unit Seven	lecture	Assignment
5-	2	Avoiding Pagiarism	Unit Seven	lecture	Assignment / Quiz
6-	2	Expressing Contrast	Unit Eight	lecture	Assignment

Mid-Term	2	Writing a Descriptive Essay	Unit Eight	lecture	Assignment
8-		Mid - Term Exam			
9-	2	Understanding Visual Information	Unit Nine	lecture	Assignment
10-	2	Writing a Report using visual information	Unit Nine	lecture	Assignment
11-	2	Reading Passage + Prefixes	Unit Nine	lecture	Quiz
12-	2	How to be a good Presenter	Unit Ten	lecture	Assignment
13-	2	Formal vs. Informal Vocabulary	Unit Ten	lecture	Assignment
14-	2	Dealing with longer Texts	Unit Ten	lecture	Assignment
15-		Final 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 (40 MS) average distributed as follows: (20 Ms mid-Term exam); (10 Ms Assignments); (10 Ms Class attaindance and participation);

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1] Headway: Academic Skills - Level 3
	[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] Net Sources
	[2]
	[3]
	[4]
	[5]

5.7. Research Methodology (4)

1. Course Name:	Research Methodology(4)
2. Course Code:	UOW6400
3. Semester / Year:	2nd semester 2025-2026
4. Description Preparation Date:	01/02/2026
5. Available Attendance Forms:	Actual Mandatory Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)	15 hours (1 hours per week) /1 units
7. Course administrator's name (mention all, if more than one name)	Name: | Prof. Dr Najwa Jassim Jubier Email: | njassim@uowasit.edu.iq
8. Course Objectives	1- Understand the structure and requirements of a PhD thesis in accordance with academic standards. 2- Develop and write the main chapters of a doctoral dissertation using sound scientific methodology. 3- Critically analyze literature and research results to produce high-quality academic work. 4- Apply proper referencing, citation, and academic integrity principles and avoid plagiarism. 5- Transform dissertation work into publishable scientific articles and select appropriate journals. 6- Prepare and submit scientific manuscripts professionally and respond effectively to peer-review comments. 7- Providing information to students about plagiarism and how to avoid it.
9. Teaching and Learning Strategies	1- Interactive Lectures 2- Workshops and Practical Sessions 3- Case Studies and Published Article Analysis 4- Guided Discussions and Peer Feedback 5- Independent Learning and Assignments

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

1-	1	What is a PhD? Purpose and scope of a thesis;	Introduction to PhD	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
2-	1	Title, high-level summary (Abstract), and importance of clear structure.	Structuring the Thesis	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
3-	1	Writing the introduction, research problem, objectives, and significance.	Introduction Chapter	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
4-	1	How to write a literature review; sources, synthesis, and critical analysis.	Literature Review	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
5-	1	How to write the work method, experimental design, and data collection procedures.	Methodology Chapter	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination

6-	1	Writing results for thesis and research papers; tables, figures, and clarity.	Results Chapter	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
7-	1	Analyzing results, comparing with literature, and deriving conclusions	Discussion Chapter:	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
8-	1	How to write and arrange references in thesis and research papers; citation tools (EndNote)	References & Citation	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
9-	1	Exam			
10-	1	How to transforming doctoral dissertation chapters into publishable scientific articles	Transforming doctoral dissertation chapters into publishable scientific articles	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
11-	1	Types of journals, reputable vs predatory journals, hijacked journals, and practical steps to identify high-quality journals.	Choosing the Right Journal	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination

12-	1	Impact Factor, H-index, indexing, quartile, editorial board, and metrics for assessing journal quality.	Journal Quality Indicators	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
13-	1	Manuscript Submission & Peer Review: Submission process, writing cover letters, responding to reviewers' comments.	Submission of Manuscript	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
14-	1	Plagiarism , what is the Plagiarism and ways to avoid it	Plagiarism	Theoretical instruction, supported by guided discussions and critical reading.	continuous assessment, including class participation, a report, a seminar, a midterm, and a final written examination
15-	1	Exam			

11. Course Evaluation

The final exam is worth 60% of the total grade, and the remaining 40% is divided as follows: 30% for tests, 10% for participation, activities, and seminars.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	[1]There are no references on the subject in the college library
	[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] There is no specific website on the Internet.
	[2]
	[3]
	[4]
	[5]