Ministry of Higher Education and Scientific Research

Scientific Supervision and Evaluation Authority

Department of Quality Assurance and Academic Accreditation

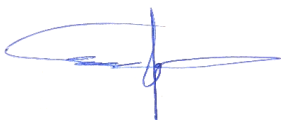
Description Form of the Academic Program of the Department of Physics

University Name: Basrah

College/Institute Name: Science

Scientific Department Name: physics

File filling date: 2024-2025

Signature: 	**Signature:**
Head of department : Prof. Dr. Wa'il A Godaymi Al-Tumah	**Scientific Associate Name:**
Date: 01/ 09/ 2024	**Date: 01/ 09/ 2024**

Check the file by: Division of Quality Assurance and University Performance

Name of the Director of the Quality Assurance and University Performance Division :

Date:

Signature:

Approval of the Dean of the College

This academic program description provides a necessary summary of the most important characteristics of the program and the learning outcomes that the student is expected to achieve, demonstrating whether he has made the most of the available opportunities. It is accompanied by a description of each course within the program.

1. Educational institution	University of Basra - College of Science
2. Scientific department/center	physics department
3. Name of the academic or professional program	General physics
4. Name of the final certificate	Bachelor of Science in Physics
5. Academic system: Annual/courses/others	Courses
6. Accredited accreditation program	Abet
7. Other external influences	Many official holidays
8. Date the description was prepared	1/9/2024
9. Objectives of the academic program	
1- Teaching the student the basic principles of physics	
2- The educational objectives of the program (printed) and are in line with the vision of the educational institution	
3- Preparing an educated generation that is armed with science and adopts it as a sound basis for bringing about radical changes and adopts scientific knowledge and the scientific method in thinking, analyzing, and adapting to the development of technologies to keep pace with the expansion of human needs.	
4- Providing an academic climate suitable for study and research, enabling the student to pursue his higher studies and contribute to finding solutions to problems using appropriate and suitable techniques.	
5- The program must have a continuous evaluation process for programmed time periods that show that the goals are based on needs.	
6- Preparing specialists in general physics and its practical applications, who are responsible for studying the country's need for development and progress and who can meet the needs of the labor market in state institutions and industry sectors.	
7- There must be a continuous calibration and evaluation process for all components of the program, which shows the desired degree and based on which the goals were set.	
10.	**11. Required program outcomes and teaching, learning and evaluation methods**
	A- Cognitive objectives 1- Make the student able to know and understand the basics of physics. 2- Make the student able to know and understand the practical applications of physics.

	3- Make the student able to understand physical phenomena from a mathematical point of view. 4- Make the student able to know and understand the basics of physics using modern software.
	B - The program's skill objectives 1 - Correct scientific research. 2 - Constructive scientific discussions and expressing opinions. 3 - Enabling the student to understand and solve scientific problems related to physical laws 4- The ability to apply the theoretical and practical experience gained from his studies in the areas of practical life, considering industrial and commercial constraints.
	Teaching and learning methods
	1- Use a drawing board and pen. 2- Presenting lectures using Power Point. 3- Using practical study methods for students through the practical laboratories available in the department and under the supervision of the academic staff. 4- Graduation projects.
	Evaluation methods
11.	1- Follow up on daily attendance 2- Conducting daily tests 3- Monthly tests 4- Final exam
12.	**13. Program structure**

Educational level	Item No.	Item type	Item Name	Credit Hour	
				theoretical	practical
First	Phy101	department Mandatory	Quantum principles	3	3
First	Phy102	department Mandatory	Material properties	2	3
First	Phy103	department Mandatory	Electricity and Magnetism	3	3
First	Phy104	department Mandatory	light	3	3
First	Comp127	College Mandatory	Computer (1)	3	
First	Math101	College Mandatory	Differentiation and integration(1)	3	
First	Math102	College Mandatory	Differentiation and integration(2)	3	
First	Math129	College Mandatory	Linear algebra	3	
First	Ch131	College Mandatory	Chemical	3	3
First	Cul101	University Mandatory	culture	3	

First	S101	University Mandatory	sport	1	
First	Lit101	University Mandatory	Arabic literature	2	
Second	Phy201	department Mandatory	Analytical Mechanics	2	
Second	Phy203	department Mandatory	Electricity and Magnetism	3	3
Second	Phy204	department Mandatory	Light	3	3
Second	Phy207	department Mandatory	Modern physics	3	
Second	Phy208	department Mandatory	Electronic principle	3	3
Second	Phy212	department Mandatory	Thermodynamic	3	
Second	Phy227	department Mandatory	Foundation of Geophysics	2	
Second	Math201	College Mandatory	Advanced Differentiation and integration	3	
Second	Math214	College Mandatory	Differential equations	3	
Second	Comp260	College Mandatory	Computer(2)	3	3
Second	Cul201	University Mandatory	Culture	3	
The third	Phy301	Compulsory department	Quantum mechanics	3	
The third	Phy302	Compulsory department	Analytical mechanics	2	
The third	Phy303	Compulsory department	Electromagnetism	3	
The third	Phy307	Compulsory department	Atomic physics	3	3
The third	Phy308	Compulsory department	Electronic	3	3
The third	Phy315	Compulsory department	Mathematical physics	3	
The third	Phy326	Compulsory department	Astronomy	3	
The third	Phy327	Compulsory collage	Computers(3)	3	3
The third	Phy301	Compulsory university	English literature	3	
The third	Phy309	Optional department	Solar energy	2	
The third	Phy310	Optional department	Logical circuits	2	
The third	Phy318	Optional department	X-ray	2	
The third	Phy338	Optional department	Physics of devices	2	
The third	Phy321	Optional department	Detectors and detection methods	2	
The third	Phy322	Optional department	Spectroscopy	2	

The third	Phy342	Optional department	The theory of relativity	2	
The fourth	Phy401	Compulsory department	Quantum mechanics	3	
The fourth	Phy405	Compulsory department	research project		
The fourth	Phy409	Compulsory department	statistics	3	
The fourth	Phy413	Compulsory department	laser	3	3
The fourth	Phy415	Compulsory department	Advanced mathematics	4	
The fourth	Phy427	Compulsory department	solid state	3	
The fourth	C460	Compulsory collage	computers	2	3
The fourth	400ph	Compulsory university	philosophy	2	
The fourth	Phy412	Optional department	optical devices	2	
The fourth	Phy420	Optional department	microwave	2	
The fourth	Phy421	Optional department	antennas	2	
The fourth	Phy428	Optional department	advanced solid	2	
The fourth	Phy429	Optional department	thin membranes	2	
The fourth	Phy430	Optional department	semiconductors	2	
The fourth	Phy431	Optional department	liquid crystals	2	
The fourth	Phy432	Optional department	polymer	2	
The fourth	Phy436	Optional department	medical physics	2	
The fourth	Phy437	Optional department	molecular	2	
The fourth	Phy457		nano	2	

Levels	
level one	0-36
Second Level	37-72
The third level	73-108
fourth level	109-143

Unite for Graduation 143	
Mandatory Department	78

Optional Department	20
College requirements	32
University requirements	13

1. Planning for personal development
1. Make the student capable of skills in laboratory group work 2. Making the student able to pass job interviews and demonstrate the academic personality required at work 3.Make the student able to pass professional and scientific tests organized by local or international bodies 4. Make the student capable of self-development after graduation 5. Encouraging faculty members to obtain the highest academic and administrative ranks 6. Continuous improvement and development of faculty members through training programs and workshops
1. Admission standard (establishing regulations related to admission to the college or institute)
According to the requirements of the Ministry of Higher Education and Scientific Research (central admission)
1. The most important sources of information about the program
1. The curriculum approved by the Ministry of Higher Education and Scientific Research and its guidelines 2. Decisions and recommendations of the scientific committees in the college and the Physics Department in particular 3. Developmental and rehabilitation courses in teaching methods 4. Internet research for similar experiences 5. Personal experiences of pioneering professors in the college and department

Syllabus skills chart																		
Please check the boxes corresponding to the individual skills outcomes from the evaluation program																		
				The skills required from the program														
Year / Level	**Course code**	**Course name**	**Mandatory or Optional**	**Cognitive aims**				**Skills objectives of the program**				**Emotional and value aims**				**General skills and transferred qualifying (other skills related to employability and personal development)**			
				A1	**A2**	**A3**	**A4**	**B1**	**B2**	**B3**	**B4**	**C1**	**C2**	**C3**	**C4**	**D1**	**D2**	**D3**	**D4**
First Stage	PHY101	Mechanics I	**Mandatory**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
First Stage	PHY102	Physics of Materials	**Mandatory**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
First Stage	PHY103	Electricity and Magnetism	**Mandatory**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
First Stage	PHY104	Light	**Mandatory**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
First Stage	COMP127	Computer Programming	**Mandatory**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
First Stage	MATH101	Mathematics I	**Mandatory**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
First Stage	MATH102	Mathematics I	**Mandatory**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
First Stage	MATH129	Linear algebra	**Mandatory**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
First Stage	CHM131	Chemistry	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√

First Stage	C101	Culture	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
First Stage	UNI101	sport	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
First Stage	L101	Arabic literature	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	PHY201	Analytical Mechanics I	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	PHY203	Electricity and Magnetism	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	PHY204	Light	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	PHY207	Modern physics	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	PHY208	Principles of electronics	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	PHY212	Thermodynamics	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	PHY227	Geophysics Fundamentals	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	MATH201		**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	MATH214		**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	COMP260	Programming in MATLAB	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Second Stage	C201	Culture	**Mandatory**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	P301	Quantum mechanics	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	P302	Analytical mechanics	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	P303	Electromagnetism	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√

Third	P307	Atomic physics	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	P308	Electronics	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	P315	Mathematical physics	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	P326	Astronomy	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	COMP 327	Calculators (3(	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	D301	English Literature	**Basic**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	P309	Solar energy	**optional**	√	√	√	√	√	√	√		√	√	√	√	√	√	√	√
Third	P310	Logic circuits	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Third	P318	X ray	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Third	P321	Reagents and detection methods	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Third	P322	Spectroscopy	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Third	P342	Theory of Relativity	**Optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	F401	Quantum mechanics	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P405	research project	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P409	Statistics	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P413	Laser	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P415	Advanced mathematics	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Fourth	P427	solid state	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	COMP 460	Calculators (4(	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	PH400	Philosophy	**Basic**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P412	Optical devices	**Optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P420	Microwave	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P421	Antennas	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P428	Advanced solid	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P429	Thin films	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P430	Semiconductor s	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P431	Liquid crystals	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P432	Polymer	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P436	Health physics	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P437	Molecular	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Fourth	P457	Nano Technology	**optional**	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

First level: Principles of Mechanics, Phy101

Course description form

Course description

Studying the behavior of particles whose speed is less than the speed of light. That is, describing the physical properties of objects. The study is divided into two parts, which deals with:

1-Studying movement by studying its properties such as speed, displacement, and acceleration. This part is part of what is called kinematics.

2-Studying the causes of movement, that is, studying the relationship between movement and its causes by studying Newton's laws and the laws of conservation of energy and momentum. This part of the study falls within what is called dynamics.

1. Educational institution	University of Basrah- College of Science
2. Scientific department/center	Physics
3. Course name/code	Principles of Mechanics Phy101
4. Programs in which it is included	Bachelor's, Master's, Doctorate
5. Available attendance forms	Weekly
6. Semester/year	2024-2025
7.Number of study hours (total)	60credit hours
Date this description was prepared	1-9-2024
1. Course objectives	
1-Studying movement by studying its properties such as speed, displacement, and acceleration. This part is part of what is called kinematics. 2-Studying the causes of movement, that is, studying the relationship between movement and its causes by studying Newton's laws and the laws of conservation of energy and momentum. This part of the study falls within what is called dynamics.	

10. Course outcomes and teaching, learning and evaluation methods
A- Cognitive objectives Introducing the student to an introduction to the principles of classical mechanics Studying movement by studying its properties such as speed, displacement, and acceleration, and this part is part of what is called kinematics. Studying the causes of movement, that is, studying the relationship between movement and its causes by studying Newton's laws and the laws of conservation of energy and momentum. This part of the study falls within what is called dynamics .
B - The skills objectives of the course B2 - Inferring movement by studying its properties
Teaching and learning methods
1-Theoretical lectures and discussions 2-Using educational means (scientific presentations and films)
Evaluation methods
1-Daily exam and laboratory reports 2-Monthly exam 3-- final exams.
C- Emotional and value goals C1- The ability to convey information after presenting it, discussing it, and interpreting it C2- Linking theoretical information with the practical aspect
Teaching and learning methods
Explanation and direct delivery of lectures.1 2.Powerpoint presentation and screen
Evaluation methods
1-Daily tests and laboratory reports 2-Monthly tests 3-Final exams

D - Transferable general and qualifying skills (other skills related to employability and personal development)
1-Developing the student's mental abilities
2-Understanding mechanical processes
Identify the principle of motion and study its properties

10. Course structure

Week	Hours	Required learning outcomes	Name of unit/or subject	Teaching method	Evaluation method
the first And the second The third is	3th + 3p every week	Student understanding of the lesson	Vectors	theoretical + practical	daily and monthly tests
ا Fourth fifth And the sixth	3th + 3p every week	Student understanding of the lesson	Kinesiology Position vector, displacement vector, rate of speed and instantaneous speed, rate of acceleration and instantaneous acceleration	theoretical + practical	daily and monthly tests
ا Seventh and eighth	3th + 3p every week	Student understanding of the lesson	Semester exam Motion in one dimension (equations of motion), an example of which is free fall	theoretical + practical	daily and monthly tests
The ninth and tenth	3th + 3p every week	Student understanding of the lesson	Movement in two dimensions, displacement vector, rate of speed and instantaneous speed., rate of acceleration and instantaneous acceleration.	theoretical + practical	daily and monthly tests
ا eleventh And the twelfth	3th + 3p every week	Student understanding of the lesson	Equations of motion in two dimensions, projectile motion	theoretical + practical	daily and monthly tests
Thirteenth	3th + 3p every week	Student understanding of the lesson	Second semester exam	theoretical + practical	daily and monthly tests
ا fourteenth And the fifteenth	3th + 3p every week	Student understanding of the lesson	Newton's laws of motion	theoretical + practical	daily and monthly tests

10. Infrastructure	
	1- Required prescribed books
2- Main references (sources)	1- Physics for scientists and engineers with modern physics, Douglas C. Giancoli, 4th edition, 2014. 2- Fundamentals of physics, Halliday, Resnick and Walker, 10th edition, 2018 Community College. 2010
A-Recommended books and references (scientific journals, reports)...,	
B - Electronic references, Internet sites...	

11- Course development plan
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

The first level: engineering optics Phy104

Course Description Form

Course Description

This course description provides a brief summary of optics and the fundamentals of engineering optics.

1. Educational Institution	University of Basrah - College of Science
2. Scientific Department/ Center	Physics
3.Name/code of the course	**Engineering Optics**
4. Programs that include	bachelor’s ,Master's, PhD
5. Attendance forms available	Weekly
6. Semester/year	2024-2025
7. The total number of study hours credit	60 credit hours
8. The date this description was prepared	1-9-2024
9. Course objectives	
The student's ability to identify optics and the basics of engineering optics	

10. Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives

* Introduce the student to an introduction to visual phenomena

B - Skills objectives of the course .

B1 – Acquire the skill of comparing visual phenomena

Teaching and learning methods

1.Future lectures and discussions
2.Using educational means (scientific presentations and films)

Evaluation methods

1-Daily tests and laboratory reports

2-Monthly tests

3- Final exams

C. Emotional and value objective

C1- The ability to communicate information after presentation, discussion and interpretation

C2- Linking information to reality and the extent of its impact on various practical fields

Teaching learning methods

1-Direct explanation and delivery of lectures.

2- Power point presentation and screen.

Evaluation methods

1-Daily tests and laboratory reports

2-Monthly tests

3- Final exams

D - Transferable general and qualifying skills (other skills related to employability and personal development).

D1- Developing the student's mental abilities

D2- Understanding visual processes and their practical applications.

10. Course structure

Week	Hours	Required learning outcomes	Name of the unit/topic	Evaluation method	Teaching method
the first And the second And the third	3	Student understanding of the lesson	**the theoretical side Concepts of quantum mechanics Wave mechanics Probability**	**Daily and monthly tests**	Theoretical
Fourth fifth And the sixth	3	Student understanding of the lesson	**the theoretical side Calibration and current density Schrödinger equation with applications**	**Daily and monthly tests**	Theoretical
Seventh and eighth	3	Student understanding of the lesson	**Semester exam the theoretical side Serious at a voltage barrier Particles bound in a potential well Simple harmonic oscillator (algebraic manipulation(**	**Daily and monthly tests**	Theoretical
The ninth and tenth	3	Student understanding of the lesson	**the theoretical side Simple harmonic oscillator (analytical treatment(Calculations of expected values**	**Daily and monthly tests**	Teaching method
Eleventh And the twelfth	3	Student understanding of the lesson	**the theoretical side Matrix formulation for quantum mechanics Momentum and position matrix**	**Daily and monthly tests**	Theoretical
Thirteenth	3	Student understanding of the lesson	**Second semester exam**	**Daily and monthly tests**	Theoretical

fourteenth And the fifteenth	3	Student understanding of the lesson	**the theoretical side The Hamiltonian matrix of the simple oscillator Pure matrix treatment of the simple harmonic oscillator**	**Daily and monthly tests**	Theoretical

Second level: Analytical Mechanics, Phy 201

Course description form

Course description

Analytical mechanics is a subfield of mathematical physics that uses analytical techniques, particularly calculus of variations, to solve problems in mechanics. As a result, instead of solving equations in vector quantities, they include solutions of differential equations in scalar quantities.

1. Educational institution	University of Basrah- College of Science
2. Scientific department/center	Physics
3. Course name/code	Analytical Mechanics, Phy 201
4. Programs in which it is included	Bachelor's, Master's, Doctorate
5. Available attendance forms	Weekly
6. Semester/year	2024-2025
7.Number of study hours (total)	60credit hours
8.Date this description was prepared	1-9-2024

1. Course objectives

The course aims to introduce students to the motion of dynamical systems that are typically described in terms of two fundamental quantities: scalars and vectors. The vector is the position vector r of a moving particle and the parameter is time t, the derivative of r with respect to t is called velocity v, the time derivative of velocity is called acceleration a. Isaac Newton's three fundamental laws of motion describe a damped harmonic oscillator. Explain the movement of charged particles in electric and magnetic fields. Newton formally announced the law of universal gravitation in his Principia . To prove Kepler's first law, the differential equation of the particle's orbit in any available central force field. Explain the center of mass and linear momentum of the system. I decided to use it as the basic Lagrange equations and Hamiltonian equations. Rotation of a rigid body about an arbitrary axis: moments and products of angular momentum, inertia, and kinetic energy.

11.Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives

Introduce students to the motion of dynamical systems that are typically described in terms of two basic quantities: scalars and vectors.

The student introduces Newton’s three basic laws of motion, a damped harmonic oscillator.

Explain the movement of charged particles in electric and magnetic fields.

Prove Kepler's first law, the differential equation of the orbit of a particle in any central force field

B - The skills objectives of the course.

B1 - Reasoning to describe dynamic systems and explain the movement of particles using basic theories and hypotheses

Teaching and learning methods

1-Theoretical lectures and discussions

) 2-Using educational means (scientific presentations and films

Evaluation methods

1-Daily tests

2-Monthly tests

3-Final exams

C- Emotional and value goals

C1- The ability to communicate information after presenting it, discussing it, and interpreting it

C2- Linking the given information to applied models

Teaching and learning methods

1-Explanation and direct delivery of lectures

2-Powerpoint presentation and screen

Evaluation methods

1-Daily tests and laboratory reports

2-Monthly tests

3-Final exams

D - Transferable general and qualifying skills (other skills related to employability and personal development).

D1- Developing the student’s mental abilities

D2 Understanding dynamic systems and their evolution.

10. Infrastructure

	1- Required prescribed books
2- Main references (sources)	1] Analytical Mechanics, 7ed, by G. Fowles & G. Cassiday [2] Theoretical Physics 2 (Analytical Mechanics), by Wolfgang Nolting
A-Recommended books and references (scientific journals, reports)....,	
B - Electronic references, Internet sites..	

Week	Hours	Required learning outcomes	Name of unit/or subject	theoreti cal	Evaluation method
the first And the second The third	2Theoretical	Student understan ding of the lesson	Lagrange mechanics + coordinates to determine + Lagrange equations of motion for conservative systems	theoreti cal	daily and monthly tests
١ Fourth fifth And the sixth	2Theoretical	Student understan ding of the lesson	Constraint forces: Lagrange factorials +D'Alembert's principle: generalized force Potential energy and balance: stability	theoreti cal	daily and monthly tests
١ Seventh and eighth	2Theoretical	Student understan ding of the lesson	Semester exam the theoretical side Coupled harmonic oscillators: normal coordinates	theoreti cal	daily and monthly tests
The ninth and tenth	2Theoretical	Student understan ding of the lesson	Vibration of continuous systems: the wave equation Introduction: Center of mass and linear momentum of a system.	theoreti cal	daily and monthly tests
١ eleventh And the twelfth	2Theoretical	Student understan ding of the lesson	Collisions +The anniversary of the founding of the Iraqi army	theoreti cal	daily and monthly tests
Thirteenth	2Theoretical	Student understan ding of the lesson	Second semester exam	theoreti cal	daily and monthly tests
١ fourteenth And the fifteenth	2Theoretical	Student understan ding of the lesson	Center of mass of a rigid body + rotation of a rigid body about a fixed axis: moment of inertia	theoreti cal	daily and monthly tests
11- Course developm ent plan	Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences				

Second level: Electricity and Magnetism, Phy203

Course description form

Course description

The course description focuses on magnetic fields and their relationship to electric fields.

Calculating the magnetic fields arising from direct electric current and their applications in circuits through the Biot-Svart law and studying magnetic induction extensively.

Studying transient currents in circuits (resistance-amplitude) and resistance-inductance-amplitude circuits and knowing the states of growth and decay of current in them.

1. Educational institution	University of Basrah- College of Science
2. Scientific department/center	Physics
3. Course name/code	Electricity and Magnetism, Phy203
4. Programs in which it is included	Bachelor's, Master's, Doctorate
5. Available attendance forms	Weekly
6. Semester/year	2024-2025
7.Number of study hours (total)	60credit hours
9.Date this description was prepared	1-9-2024
10.Course objectives	

1-The course focuses on magnetic fields and their relationship to electric fields, where methods for detecting magnetic fields and the movement of electrically charged charges and objects within magnetic fields are studied, and thus calculating the magnetic flux and magnetic force that arise due to this movement.
2-Calculating the magnetic fields generated by direct electric current and their applications in circuits through Biot-Svart's Law and Ampere's Law.
3-Studying magnetic induction extensively through Faraday's law and Lenz's law, supported by applications to know the induced electromotive force and the induced electric current as a

result of the movement of a source-free circuit within a magnetic field or the passage of a magnetic field that interrupts this circuit.
4-Studying transient currents in (resistance-amplitude) and (resistance4inductance-amplitude) circuits and knowing the states of current growth and decay in them.

11. Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives

Calculating the magnetic fields arising from direct electric current and their applications in circuits through the Biot-Svart law and studying magnetic induction extensively.

Studying transient currents in circuits (resistance-amplitude) and resistance-inductance-amplitude circuits and knowing the states of growth and decay of current in them.

B - The skills objectives of the course.

1-Reasoning about the calculation of magnetic fields arising from direct electric current and their applications to circuits through the Biot-Svart law and Ampere's law, magnetic induction and transient currents in electronic rotors.

Teaching and learning methods

1-Theoretical lectures and discussions
) 2-Using educational means (scientific presentations and films

Evaluation methods

1-Daily tests and laboratory reports
2-Monthly tests
3-Final exams

C- Emotional and value goals

C1- The ability to communicate information after presenting it, discussing it, and interpreting it.
C2- Linking theoretical information to the practical part and experimenting with it.

Teaching and learning methods

1-Explanation and direct delivery of theoretical and practical lectures.
2-Powerpoint presentation and screen.

Evaluation methods

1-Daily tests and laboratory reports
2-Monthly tests
3-Final exams

D - Transferable general and qualifying skills (other skills related to employability and personal development),

1-Developing the student's mental abilities

2-Understanding electric and magnetic fields in order to apply them

10. Course structure

Week	Hours	Required learning outcomes	Name of unit/or subject	Teaching method	Evaluation method
the first And the second The third is	3th + 3p every week	Student understanding of the lesson	the magnetic field	theoretical + practical	daily and monthly tests
ا Fourth fifth And the sixth	3th + 3p every week	Student understanding of the lesson	Magnetic field of direct current electric current	theoretical + practical	daily and monthly tests
ا Seventh and eighth	3th + 3p every week	Student understanding of the lesson	Electromagnetic induction	theoretical + practical	daily and monthly tests
The ninth and tenth	3th + 3p every week	Student understanding of the lesson	Electromagnetic induction	theoretical + practical	daily and monthly tests
ا eleventh And the twelfth	3th + 3p every week	Student understanding of the lesson	Electromagnetic induction	theoretical + practical	daily and monthly tests
Thirteenth	3th + 3p every week	Student understanding of the lesson	Second semester exam	theoretical + practical	daily and monthly tests
ا fourteenth And the fifteenth	3th + 3p every week	Student understanding of the lesson	Transient current circuits	theoretical + practical	daily and monthly tests

10. Infrastructure

	1- Required prescribed books
2- Main references (sources)	Foundations of Electricity and Magnetism(1) Dr. Rashid Abdul Razzaq Al-Rashed Dr. Nazim Hassoun Al-Attar Fundamentals of Electricity and Magnetism,(2) Yahya Abdel Hamid. Electricity and Magnetism, Ibrahim Nasser(3) Ibrahim .

A-Recommended books and references (scientific journals, reports)...,	
B - Electronic references, Internet sites...	

11- Course development plan
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

Level 2 Physical Optics Phy204

Course description form

Course description

Teaching students the Teaching students the principles, theoretical foundations, and practical applications of physical optics related to wave motion and wave superposition, then the phenomena of interference, diffraction, and polarization of light.

1.Educational institution	1. University of Basra - College of Science
Scientific department /center	Physics
3. Course name/code	Physical Optics Phy204
4.Programs in which it is included	Bachelor's, Master's, Doctorate
5.Available attendance forms	weekly
6.Semester/year	2024-2025
)7.Number of study hours (total	60 credit hours
8.Date this description was prepared	1-9-2024
2. 9.Course objective	
Teaching students the principles, theoretical foundations, and practical applications of physical optics related to wave motion and wave superposition, then the phenomena of interference, diffraction, and polarization of light.	

Course outcomes and teachin, learning and evaluation methods
A- Cognitive objectives **.The student's introduction to the optical phenomena of interference, diffraction, and polarization of light** Knowledge of the principles, theoretical foundations and practical applications of physical optics related to wave motion and wave superposition
B - The skills objectives of the course . B1-Acquiring the skill of comparing visual phenomena-
Teaching and learning methods
1.Theoretical lectures and discussions 2.Using educational tools (presentations and scientific films)
Evaluation methods
.1.Daily tests and laboratory reports 2.Monthly test 3.Final exams
C- Emotional and value goals C1- The ability to communicate information after presenting it, discussing it, and interpreting it C2- Linking information to the environmental reality and the Earth's system and the extent of its impact on different organisms
Teaching and learning methods
1.Explanation and direct delivery of lectures Presentation **2.Powerpoint** and screen
Evaluation methods
1.Daily tests and laboratory reports 2.Monthly tests 3.Final exams
D.General and qualifying transferable other skills related to employability and personal development skills (other skills related to employability and personal development) D1- Developing the student's mental abilities Development and practical applications of physical optics related to wave motion and wave superposition

10. Course structure					
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Daily and monthly tests	Theoretical + practical	**Wave equation** **Wave equation and principle of superposition of waves** **Principle of superposition of waves**	Student understanding of the lesson	3 N + 3 D every week	**the first And the second And the third**
Daily and monthly tests	Theoretical + practical	**Light interference** **Wave front splitters**	Student understanding of the lesson	3N + 3 D every week	**Fourth fifth And the sixth**
Daily and monthly tests	Theoretical + practical	**Wave amplitude splitters Multiple packet interference**	Student understanding of the lesson	3N + 3 D every week	**Seventh and eighth**
Daily and monthly tests	Theoretical + practical	**diffraction** **Fraunhofer diffraction**	Student understanding of the lesson	3N + 3 D every week	**The ninth and tenth**
Daily and monthly tests	Theoretical + practical	**Fresnel diffraction** **polarization**	Student understanding of the lesson	3N + 3 D every week	**eleventh And the twelfth**
Daily and monthly tests	Theoretical + practical	**Second semester exam**	Student understanding of the lesson	3N + 3 D every week	**Thirteenth**
Daily and monthly tests	Theoretical + practical	**Polarization methods+ Mathematical representation of polarized light and polarizers**	Student understanding of the lesson	3N + 3 D every week	**fourteenth And the fifteenth**

11. Infrastructure	
	-1Required prescribed books
[1] Introduction to Optics, *FJ Pedrotti , LM Pedrotti* and *LS Pedrotti* , 3rd ed ., 2007. [2] Optics, *Eugene Hecht* , 5th ed . , 2017. ed., 2010. (Translated by: Dr. Muhammad Abdel Hamid Darwish + Dr. Ali Abdel Hamid Darwish) [3] FUNDAMENTAL OF OPTICS , Francis A. JENKINS and Harvey E. WHITE, 4th ed ., 2001. Part, 2 (Translated by: Dr. Abdel Fattah Al-Shazly + Dr. Saeed Al-Jaziri)	-2Main references (sources(
	Recommended books and references (scientific journals, reports(...,
	B - Electronic references, Internet sites...

12. Course development plan
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiencesok

second Level Fundamentals of Electronics Phy208
Course Description Model
Course Description

Introduction to semiconductor materials, their types, and their applications in electronic circuits. Introduction to some applications of semiconductor materials, which is the bipolar diode, its specifications, applications, and types, such as the Zener diode, the solar cell diode, and the light-emitting diode. Analysis of bipolar diode circuits and identification of its current-voltage characteristic. Also, studying the bipolar junction transistor in terms of its connection to electronic circuits, its applications, types, and uses.

1-educational institution	University of Basra- College of Science
2-the scientific section/center	**Physics**
3-name/code of the course	Fundamentals of Electronics
4- the programs that it enters into	bachelor's, master's and doctorate degree
5- available attendance forms	**weekly**
6-year	**2024-2025**
7- number of study hours	**60 hours**
8- date of description	**1-9-2024**
9- course objectives	
Study of semiconductor diodes and their types and applications, and study of bipolar junction transistors and their types, how they work, and their applications in electronic circuits..	

10- Learning outcomes, teaching and learning methods, and assessment

a- cognitive goals
- introduction to Basic Electronic Components for Students
- Definition of a Crystal Diode and Its Type

-Study of the Applications of Crystal Diodes

-Study of Bipolar Junction Transistors and Their Types

-How Transistors Work and Their Applications in Electronic Circuits

b- Specific Course Skills Objectives **1-** Acquiring the skill of practical application of theoretical knowledge in the laboratory to create electronic circuits." **2- Inference of the types of crystalline diodes and transistors and the difference between their types**
Methods of Teaching and Learning
1- Theoretical lectures and discussions **2-** Use of educational materials (presentations and scientific films)
Methods of assessment
1- Daily tests and laboratory reports **2-** Monthly tests **3-** Final exams
c- Affective and value goals **1-** The ability to convey information after presenting, discussing, and interpreting it
Methods of Teaching and Learning
1-Direct explanation and delivery of lectures 2-Presentation power point and screen
d-General and transferable skills (other skills related to employability and personal development **1- developing the student's mental abilities)**

11-course structure					
week	**hours**	required learning outcomes	the name of the unit	Method of education	Method of evaluation
First ,second and third	**3th+3pa** every week	student's understanding of the lesson	**Ch1:Crystal structure of atomic models,** Chemical bonds, **Theory of energy**	theoretical	daily and monthly tests

			bands of pure semiconductor crystals, n-type crystal, p-type crystal, Density of states, Concentration of charge carriers, Current density		
Fourth,fifth and sixth	**3th+3pa** every week	student's understanding of the lesson	Ch2:Junctions**,** Types of junctions, Metal-semiconductor junction, Schottky diode. Junctions(n-type semiconductor, p-type semiconductor)	theoretical	daily and monthly tests
the seventh and eighth	**3th+3pa** every week	student's understanding of the lesson	Ch3:A diode is a semiconductor device that allows current to flow in one direction only. The current-voltage characteristic of a diode is a graPhythat shows the relationship between the current flowing through the diode and the voltage applied to it. ,The control of the depletion region width of	theoretical	daily and monthly tests

			a diode is a technique used to adjust the electrical properties of the diode. ,The analysis of electrical circuits for a diode is the process of determining the current and voltage in a circuit that contains a diode.		
ninth and tenth	**3th+3pa** every week	student's understanding of the lesson	**Ch3: Crystal diode zener diode** **Ch4: Applications of the Bipolar Junction Transistor. Tuning and Filter Circuits**	theoretical	daily and monthly tests
eleventh and twelfth	**3th+3pa** every week	student's understanding of the lesson	**Ch4: Applications of the semiconductor diode. Peak clipping circuits, Logic circuits, Solar cells, Light-emitting diodes**	theoretical	daily and monthly tests
the thirteenth	**3th+3pa** every week	student's understanding of the lesson	second semester exam	theoretical	daily and monthly tests
fourteenth and fifteenth	**3th+3pa** every week	student's understanding of the lesson	**Ch4: Bipolar junction transistor, How a BJT**	theoretical	daily and monthly tests

			works, PNP transistor characteristics, Emitter circuit. NPN transistor characteristics, Common emitter circuit for NPN transistor, Common emitter circuit for PNPtransistor		

12- infrastructure	
1- required textbooks	
2- references	**1-**Principles of Electronics by Malvino **2-semiconductor devices, physics and technology.S.M.SZE**
a- Recommended books and references (scientific journals, reports)	
b-Books and references recommended (electronic references, websites)	

13- course development plan
Communication in curriculum development based on the latest releases of books and references, the adoption of modern interactive education tools, and the activation of twinning programs with international universities to learn about modern curricula and teaching methods and exchange experiences

Level two Thermodynamic V212

Course description form

Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description.

1. Educational Institution	University of Basrah - College of Science
2. Scientific Department/ Center	Physics
3.Name/code of the course	Thermodynamic Phy212
4. Programs that include	bachelor's degree
5. Attendance forms available	Weekly
6. Semester/year	2024-2025
7. The total number of study hours credit	45 credit hours
8. The date this description was prepared	1-9-2024
9. Course objectives	
It is interested in the study of energy and its transformations, as well as the study of the analysis of the properties of a substance that is affected by temperature change.	

10. Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives

 Introduce the student to thermodynamics and thermodynamic processes.

B - The skills objectives of the course

B1 – Acquire the skill of knowledge of thermodynamic processes.

Teaching and learning methods

1.Future lectures and discussions
2.Using educational means (scientific presentations and films)

Evaluation methods

1-Daily tests and laboratory reports

2-Monthly tests

3- Final exams

C- Emotional and value objectives

C1- The ability to convey information after presenting it, discussing it, and interpreting it

Teaching and learning methods

1-Direct explanation and delivery of lectures.

2- Power point presentation and screen.

Evaluation methods
1-Daily tests and laboratory reports 2-Monthly tests 3- Final exams
D - Transferable general and qualifying skills (other skills related to employability and personal development). D1- Developing the student’s mental abilities

10. Course structure

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	Hours	Week
Daily and monthly tests	Theoretical	**Theoretical aspect Chapter One / Basic Concepts in Thermodynamics Chapter Two / Temperature (Temperature - Temperature Scales - Triple Point of Water(**	Student understanding of the lesson	3	**the first And the second And the third**
Daily and monthly tests	Theoretical	**Theoretical aspect Chapter Three: Methods of Heat Transfer 3.1Specific heat (specific heat capacity(3.2Latent heat 3.3Heat transfer by conduction 3.4Heat transfer by convection 3.5Heat transfer by radiation 3.6Teuton's law of refrigeration Chapter Four: Case Equation 4.1Introduction 4.2Equation of the case empirically 4.3Qualities of an ideal gas 4.5Laws of gases 4.6State equation for real gases**	Student understanding of the lesson	3	**Fourth fifth And the sixth**
Daily and monthly tests	Theoretical	**Semester Exam Theoretical aspect Solution of Chapter II and III problems**	Student understanding of the lesson	3	**Seventh and eighth**

		First, second and third semester exam			
Daily and monthly tests	Theoretical	**Theoretical aspect Chapter Five: Work 5.1Introduction 5.2Thermodynamic process -1Reversible operations -2Non-reversible operations -3Isothermal processes 5.3Calculation of work in thermodynamics 5.4Solving the workpiece equation 5.5Dependence of the workpiece on the course of the process Work in thermodynamic processes of ideal gas -1Isothermal reversible process**	Student understanding of the lesson	3	**The ninth and tenth**
Daily and monthly tests	Theoretical	**Theoretical aspect -2Isothermal reversible process with constant pressure -3Fixed size isothermal reversible process -4Free Stretching Process 5.7Volumetric expansion coefficients and regression 5.8Work in terms of volumetric expansion coefficient and refractive index 5.9Workpiece for solids and liquids 5.10Case Equation for Non-Gaseous Substances**	Student understanding of the lesson	3	**Eleventh And the twelfth**

		5.11Perfect and Incomplete Differentiation			
Daily and monthly tests	theoretical	**Second Semester Exam**	Student understanding of the lesson	3	**Thirteenth**
Daily and monthly tests	theoretical	**Theoretical aspect Chapter Six: The First Law of Thermodynamics 6.1Introduction 6.2Formula of the first law in thermodynamics for ideal gas -1The first law of the isoparic process (changes in the amount of heat under constant pressure(-2The first law of the isometric process (changes in the amount of heat under a constant volume(-3The first law of the isothermic process (changes in the amount of heat under a constant temperature(6.3Specific heat capacity (C**	Student understanding of the lesson	3	**fourteenth And the fifteenth**

10. البنية التحتية

	1- Required prescribed books
Thermodynamics	2- Main references (sources)
	A- Recommended books and references (scientific journals, reports(...,

	B - Electronic references, Internet sites...

10. Course development plan
Communicating in developing the curriculum based on recent versions of books and references Adopting modern interactive teaching methods Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

10. Course development plan
Communicating in developing the curriculum based on recent versions of books and references Adopting modern interactive teaching methods Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

Second level: Geophysics, Phy227

Course description form

Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description.

1. Educational Institution	University of Basrah - College of Science
2. Scientific Department/ Center	Physics
3.Name/code of the course	Geophysics Phy227
4. Programs that include	bachelor’s degree
5. Attendance forms available	Weekly
6. Semester/year	2024-2025
7. The total number of study hours credit	30 credit hours
8. The date this description was prepared	1-9-2024
9. Course objectives	
The student's ability to recognize physical applications in geological exploration	

10. Course structure

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	Week
Daily and monthly tests	Theoretical	the theoretical side Chapter 1 Introduction to the interior of the Earth and its main parts and components Thermodynamic theory Chapter 2: Geophysical methods in geology, seismic methods	Student understanding of the lesson	2	**the first And the second And the third**
Daily and monthly tests	Theoretical	**the theoretical side Primary waves, secondary waves, and Rayleigh-Wolf waves The basic principles of wave travel, stress and ductility, elastic constants and their relationship with the speed of elastic waves. Semester exam**	Student understanding of the lesson	2	**Fourth fifth And the sixth**
Daily and monthly tests	Theoretical	**the theoretical side**	Student understanding of the lesson	2	**Seventh and eighth**

		Principles of seismography, types of earthquakes Propagation of seismic waves between different layers, reflection method and refraction method			
Daily and monthly tests	Theoretical	**the theoretical side Chapter 3: The attractive method Chapter 4: The electrical method**	Student understanding of the lesson	2	**The ninth and tenth**
Daily and monthly tests	Theoretical	**the theoretical side discussion Chapter 5: Magnetic method**	Student understanding of the lesson	2	**Eleventh And the twelfth**
Daily and monthly tests	theoretical	**Second semester exam**	Student understanding of the lesson	2	Thirteenth fourteenth And the fifteenth
Daily and monthly tests	theoretical	**the theoretical side Review and discuss**	Student understanding of the lesson	2	Fourteenth

10. Infrastructure

	1- Required prescribed books
1- Hamblin, W.K, Ghrstiansen, E,H, 1998, (Earth Dynamic System). Prentic Hall, New jersey, Eight Edition. 2- John Milson, 2003, Field Gophysics, John wiley and sons, third Edition. 3- El-Arabi ,H, Shendi,2007, Introduction of geophysics , 4- Boris Khesin, 2005, PHYSICAL METHODS AND APPROACHES IN ENVIRONMENTAL STUDIES	2- Main references (sources)

	A- Recommended books and references (scientific journals, reports(...,
	B - Electronic references, Internet sites...

10. Course development plan
Communicating in developing the curriculum based on recent versions of books and references Adopting modern interactive teaching methods Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

Level Three: Quantum Mechanics, Phy301

Course description form

Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description.

1. Educational Institution	University of Basrah - College of Science
2. Scientific Department/ Center	Physics
3.Name/code of the course	Quantum Mechanics Phy301
4. Programs that include	bachelor's ,Master's
5. Attendance forms available	Weekly
6. Semester/year	2024-2025
7. The total number of study hours credit	45 credit hours
8. The date this description was prepared	1-9-2024
9. Course objectives	

The course in 301 aims to provide the student with an understanding of the group of physical theories that appeared in the twentieth century to explain phenomena at the atomic level or below. These theories combined the particle property and the wave property to reveal the term wave-particle duality. Thus, the responsibility of quantum mechanics becomes the physical interpretation at the atomic level.

10. Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives

- ✓ - Introducing the student to the basics of quantum mechanics
- ✓ - Introducing the student to the time-dependent and non-time-dependent Schrodenker equation
- ✓ - Study of the wave function

B - The skills objectives of the course

B1 - Calculations of expected values.

B2 - Matrix formulation for quantum mechanics

Teaching and learning methods

1.Future lectures and discussions
2.Using educational means (scientific presentations and films)

Evaluation methods

1-Daily tests and laboratory reports

2-Monthly tests

3- Final exams

C- Emotional and value objectives

C1- The ability to convey information after presenting it, discussing it, and interpreting it

Teaching and learning methods

1-Direct explanation and delivery of lectures.

2- Power point presentation and screen.

Evaluation methods

1-Daily tests and laboratory reports

2-Monthly tests

3- Final exams

D - Transferable general and qualifying skills (other skills related to employability and personal development).

D1- Developing the student’s mental abilities

D2 Understanding subsurface and subsurface physical geological processes

Identify geological risks and their impact on the biosphere

D3 The identification of microorganisms and their effects is still over

10. Course structure

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	Hours	Week
Daily and monthly tests	Theoretical	**the theoretical side Concepts of quantum mechanics Wave mechanics Probability**	Student understanding of the lesson	3	**the first And the second And the third**
Daily and monthly tests	Theoretical	**the theoretical side Calibration and current density Schrödinger equation with applications**	Student understanding of the lesson	3	**Fourth fifth And the sixth**
Daily and monthly tests	Theoretical	**Semester exam the theoretical side Serious at a voltage barrier Particles bound in a potential well Simple harmonic oscillator (algebraic manipulation(**	Student understanding of the lesson	3	**Seventh and eighth**
Daily and monthly tests	Teaching method	**the theoretical side Simple harmonic oscillator (analytical treatment(Calculations of expected values**	Student understanding of the lesson	3	**The ninth and tenth**
Daily and monthly tests	Theoretical	**the theoretical side Matrix formulation for quantum mechanics Momentum and position matrix**	Student understanding of the lesson	3	**Eleventh And the twelfth**
Daily and monthly tests	Theoretical	**Second semester exam**	Student understanding of the lesson	3	**Thirteenth**
Daily and monthly tests	Theoretical	**the theoretical side The Hamiltonian matrix of the simple oscillator**	Student understanding of the lesson	3	**fourteenth And the fifteenth**

		Pure matrix treatment of the simple harmonic oscillator			

10. Course structure

Week	Hours	Required learning outcomes	Name of the unit/topic	Evaluation method	Teaching method
the first And the second And the third	3	Student understanding of the lesson	**the theoretical side Concepts of quantum mechanics Wave mechanics Probability**	**Daily and monthly tests**	Theoretical
Fourth fifth And the sixth	3	Student understanding of the lesson	**the theoretical side Calibration and current density Schrödinger equation with applications**	**Daily and monthly tests**	Theoretical
Seventh and eighth	3	Student understanding of the lesson	**Semester exam the theoretical side Serious at a voltage barrier Particles bound in a potential well Simple harmonic oscillator (algebraic manipulation(**	**Daily and monthly tests**	Theoretical
The ninth and tenth	3	Student understanding of the lesson	**the theoretical side Simple harmonic oscillator (analytical treatment(Calculations of expected values**	**Daily and monthly tests**	Teaching method
Eleventh And the twelfth	3	Student understanding of the lesson	**the theoretical side Matrix formulation for quantum mechanics Momentum and position matrix**	**Daily and monthly tests**	Theoretical
Thirteenth	3	Student understanding of the lesson	**Second semester exam**	**Daily and monthly tests**	Theoretical

fourteenth And the fifteenth	3	Student understanding of the lesson	**the theoretical side The Hamiltonian matrix of the simple oscillator Pure matrix treatment of the simple harmonic oscillator**	**Daily and monthly tests**	Theoretical

10. Infrastructure	
1- Required prescribed books	
2- Main references (sources)	[1] Introduction to Quantum Mechanics by David Kervith [2] Introduction to Quantum Mechanics by Dr. Hashem Abboud and Dr. Diaa Al-Mukhtar in Arabic [3] Fundamentals of Quantum Mechanics by Robert White

10. Course development plan

Communicating in developing the curriculum based on recent versions of books and references
Adopting modern interactive teaching methods
Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

Third Level atomic physics Phy307
Course Description Model
Course Description

This course description provides a concise summary of the course's key features and the learning outcomes that students are expected to achieve, demonstrating whether they have made the most of the learning opportunities available. It is necessary to link them to the program description.

1-educational institution	University of Basra- College of Science
2-the scientific section/center	**Physics**
3-name/code of the course	atomic physics phy307
4- the programs that it enters into	bachelor's
5- available attendance forms	**weekly**
6-year	**2024-2025**
7- number of study hours	**60 hours**
8- date of description	**1-9-2024**
9- course objectives	
the student's ability to understand the different types of atomic interactions	

10- Learning outcomes, teaching and learning methods, and assessment

a- cognitive goals **- Introduction to quantum numbers in atomic structure** **- Hund's rule** **- Zeeman effect**
b- Specific Course Skills Objectives acquiring the skill of diagnosing atomic spectra
Methods of Teaching and Learning
1- Theoretical lectures and discussions **2-** Use of educational materials (presentations and scientific films)
Methods of assessment
1- Daily tests and laboratory reports **2-** Monthly tests **3-** Final exams
c- Affective and value goals **1-** The ability to convey information after presenting, discussing, and interpreting it
Methods of Teaching and Learning

1-Direct explanation and delivery of lectures 2-Presentation power point and screen
d-General and transferable skills (other skills related to employability and personal development **1- developing the student's mental abilities)**

11-course structure					
week	**hours**	required learning outcomes	the name of the unit	Method of education	Method of evaluation
First ,second and third	**3th+1pa**	student's understanding of the lesson	Theoretical aspect: Atomic spectra Bohr's theory Quantization of the hydrogen atom	theoretical	daily and monthly tests
Fourth,fifth and sixth	**3th+1pa**	student's understanding of the lesson	Theoretical aspect: **Principle of complementarily**, **Semester exam**, **quantitative numbers in atomic structure**	theoretical	daily and monthly tests
the seventh and eighth	**3th+1pa**	student's understanding of the lesson	Theoretical aspect: Pauli exclusion principle, Hund's rule	theoretical	daily and monthly tests
ninth and tenth	**3th+1pa**	student's understanding of the lesson	**Semester exam**, Theoretical aspect: **Orbital and spin dipole moment of an electron**	theoretical	daily and monthly tests
eleventh and twelfth	**3th+1pa**	student's understanding of the lesson	Theoretical aspect: spin-orbit	theoretical	daily and monthly tests

			interaction selection rules		
the thirteenth	**3th+1pa**	student's understanding of the lesson	**Second semester exam**	theoretical	daily and monthly tests
fourteenth and fifteenth	**3th+1pa**	student's understanding of the lesson	Theoretical aspect: zeeman effect,t stark effect	theoretical	daily and monthly tests

12- infrastructure	
1- required textbooks	
2- references	atomic physics-talib nahi alkhafaje modern physics-**munem mashkor**
a- Recommended books and references (scientific journals, reports)	
b-Books and references recommended (electronic references, websites)	

13- course development plan
Communication in curriculum development based on the latest releases of books and references, the adoption of modern interactive education tools, and the activation of twinning programs with international universities to learn about modern curricula and teaching methods and exchange experiences

Forth Level Quantum mechanics Phy401
Course Description Model
Course Description

This course description provides a concise summary of the course's key features and the learning outcomes that students are expected to achieve, demonstrating whether they have made the most of the learning opportunities available. It is necessary to link them to the program description.

1-educational institution	University of Basra- College of Science
2-the scientific section/center	**Physics**
3-name/code of the course	**Principles of Electricity and Magnetism**
4- the programs that it enters into	bachelor's ,master's degree
5- available attendance forms	**weekly**
6-year	**2024-2025**
7- number of study hours	**60 hours**
8- date of description	**1-9-2024**
9- course objectives	
The course is designed for fourth-year students and includes four chapters. Chapter 1 is dedicated to the study of quantum mechanics in three dimensions, and includes a detailed study of angular momentum and orbital angular momentum (spin). Chapter 2 provides an in-depth study of time-independent perturbation theory, with examples of calculating the energy and wave functions of bound and unbound states. Chapter 4 explains the semiclassical approximation, also known as the WKB approximation, and provides a study of the classical region and an explanation of the quantum tunneling phenomenon.	

10- Learning outcomes, teaching and learning methods, and assessment

a- cognitive goals **Definition of quantum mechanics in three dimensions** **Definition of Schrödinger equation in spherical coordinates** **Definition of hydrogen atom**
b- Specific Course Skills Objectives **1- Acquiring the skill of knowing the details of electricity and magnetism** **2- The study of Coulomb's law is extremely important because it provides information about static electricity, how to calculate electrostatic force, and how to determine the resultant of these forces.**
Methods of Teaching and Learning
1- Theoretical lectures and discussions **2-** Use of educational materials (presentations and scientific films)
Methods of assessment
1- Daily tests and laboratory reports

2- Monthly tests **3-** Final exams
c- Affective and value goals **1-** The ability to convey information after presenting, discussing, and interpreting it
Methods of Teaching and Learning
1-Direct explanation and delivery of lectures 2-Presentation power point and screen
d-General and transferable skills (other skills related to employability and personal development **1- developing the student's mental abilities)**

11-course structure					
week	**hours**	required learning outcomes	the name of the unit	Method of education	Method of evaluation
First ,second and third	**3th**	student's understanding of the lesson	Theoretical aspect: **3D quantum mechanics, spherical Schrödinger equation, hydrogen atom**	theoretical	daily and monthly tests
Fourth,fifth and sixth	**3th**	student's understanding of the lesson	Theoretical aspect: Angular momentum and intrinsic angular momentum (spin) Time-independent perturbation theory	theoretical	daily and monthly tests

			Perturbation theory for non-degenerate levels Stark effect		
the seventh and eighth	**3th**	student's understanding of the lesson	**Term Exam, Theoretical Side, Theory of Perturbations for Degenerate Levels**	theoretical	daily and monthly tests
ninth and tenth	**3th**	student's understanding of the lesson	Theoretical aspect: method of covariance	theoretical	daily and monthly tests
eleventh and twelfth	**3th**	student's understanding of the lesson	Theoretical aspect: **Theory and Applications of the Ground State of the Harmonic Oscillator**	theoretical	daily and monthly tests
the thirteenth	**3th**	student's understanding of the lesson	second semester exam	theoretical	daily and monthly tests
fourteenth and fifteenth	**3th**	student's understanding of the lesson	Theoretical aspect: **Semiclassical approximation and classical region quantum tunneling connection formulas**	theoretical	daily and monthly tests

12- infrastructure	
1- required textbooks	
2- references	**Introduction to quantum mechanics (second edition)by david J.Griffiths(2005)** **2- Introduction to Quantum Mechanics**

	Prof-hashim abood qasim
a- Recommended books and references (scientific journals, reports)	
b-Books and references recommended (electronic references, websites)	

13- course development plan
Communication in curriculum development based on the latest releases of books and references, the adoption of modern interactive education tools, and the activation of twinning programs with international universities to learn about modern curricula and teaching methods and exchange experiences

Fourth level: Statistical Physics, Phy409
Course description form

Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description.

1.Educational institution	3. University of Basra - College of Science
Scientific department /center	physics
3. Course name/code	Statistical Physics Phy409
4.Programs in which it is included	Bachelor's degree, Master's degree
5.Available attendance forms	weekly
6.Semester/year	2024-2025
)7.Number of study hours (total	30 credit hours
8.Date this description was prepared	1-9-2024

4. 9.Course objective

It aims to divide the physical properties into apparent ones that can be measured directly and microscopic ones that can be measured indirectly. These properties are linked to the movement of huge numbers of particles, making it impossible to use equations that describe the detailed movement of particles to calculate them .The task of statistical physics is to calculate apparent properties in terms of microscopic properties without the need to perform detailed calculations of the movement of these particles.

Course outcomes and teachin, learning and evaluation methods

A- Cognitive objectives

- ✓ **Deriving distribution laws for classical and quantitative statistics.**

  Prove the principle of equal energy distribution and its application in calculating the specific heat of gases

  The contribution of electrons to the specific heat of metals.

  .Apply the Bose-Einstein distribution to learn about the properties of a superfluid and the behavior of helium, for example, as a superfluid at a temperature less than 2.19 K

B - The skills objectives of the course .

.B1 - Acquire the skill of applying distribution laws in calculating rates of various physical properties

B2- Derivation of the Fermi-Dirac distribution law and identifying the properties of the Fermi function and the fermionic gas

B3-Solving the apparent contradiction of compression and deriving a formula for entropy according to the classical objective

Teaching and learning methods

1.Theoretical lectures and discussions
2.Using educational tools (presentations and scientific films)

Evaluation methods

1.Daily tests and laboratory reports
2.Monthly test
3.Final exams

C- Emotional and value goals

C1- The ability to communicate information after presenting it, discussing it, and interpreting it

C2-- Linking information to the environmental reality and the Earth's system and the extent of its impact on different organisms

Teaching and learning methods
1.Explanation and direct delivery of lectures Presentation **2.Powerpoint** and screen
Evaluation methods
.1.Daily tests and laboratory reports 2.Monthly tests 3.Final exams
-D.General and qualifying transferable other skills related to employability and personal development skills (other skills related to employability and personal development) D1- Developing the student's mental abilities D2- Defining virtual and microscopic properties with examples and explaining the necessity of statistical physics D3- Defining bosons and fermions, identifying their properties, and deriving the Bose-Einstein distribution law and the bosonic gas.

13. Course structure

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Daily and monthly tests	theoretical	**the theoretical side introduction Maxwell-Boltzmann distribution (1(Maxwell-Boltzmann distribution (2(**	Student understanding of the lesson	2 n	**the first And the second And the third**
Daily and monthly tests	theoretical	**the theoretical side Quantitative statistics (1(Quantitative statistics (2(Equal distribution of energy**	Student understanding of the lesson	2 n	**Fourth fifth And the sixth**
Daily and monthly tests	theoretical	**Semester exam the theoretical side Statistical thermodynamics**	Student understanding of the lesson	2 n	**Seventh and eighth**
Daily and monthly tests	theoretical	**the theoretical side Semi-classical ideal gas Photon gas**	Student understanding of the lesson	2 n	**The ninth and tenth**
Daily and monthly tests	theoretical	**the theoretical side Phonon gas Electronic gas**	Student understanding of the lesson	2 n	**eleventh And the twelfth**
Daily and monthly tests	theoretical	**Second semester exam**	Student understanding of the lesson	2 n	**Thirteenth**
Daily and monthly tests	theoretical	**the theoretical side Ion-thermal emission Bose-Einstein condensation**	Student understanding of the lesson	2 n	**fourteenth And the fifteenth**

14. Infrastructure

	-1Required prescribed books
1] Introduction to statistical physics for students, A. J. Pointon .	-2Main references (sources(

	Recommended books and references (scientific journals, reports(...,
	B - Electronic references, Internet sites...

15. Course development plan
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

Level 4: Laser Physics, Phy413
Course description form

Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description.

1.Educational institution	5. University of Basra - College of Science
Scientific department /center	Physics
3. Course name/code	laser Physics Phy413
4.Programs in which it is included	Bachelor's degree, Master's degree
. 5.Available attendance forms	weekly
6.credit hours	2024-2025
)7.Number of study hours (total	45 credit hours
8.Date this description was prepared	1-9-2024
6. 9.Course objective	

.Define the definition of laser physics with a description of the basic principles of lasers and laser operation. Examples of phenomena that will be considered are: interactions of atoms with light, various types of spectroscopic machines, optical saturation, inverse counters, optical light pumping, optical resonators and spectrophotometers, and oscillation and amplification in lasers. The types of lasers specific to the work area are also dealt with. At the end of the course, laser applications will be explained

Course outcomes and teachin, learning and evaluation methods
A- Cognitive objectives Introducing the student to laser The basic elements of the laser Calculating laser level equations at three and four energy levels
B - The skills objectives of the course B1.Explain some commonly used types of lasers
Teaching and learning methods
1.Theoretical lectures and discussions 2.Using educational means (scientific presentation and films)
Evaluation methods
1.Daily tests and laboratory reports 2.Monthly test 3.Final exams
C- Emotional and value goals C1- The ability to communicate information after presenting it, discussing it, and interpreting it.
Teaching and learning methods
1- Explanation and direct delivery of lectures Presentation **2.Powerpoint** and screen
Evaluation methods
1.Daily tests and laboratory reports 2.Monthly tests 3.Final exams

D.General and qualifying transferable other skills related to employability and personal development skills (other skills related to employability and personal development)
D1.Developing the student's mental abilities

16. Course structure

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Daily and monthly tests	theoretical	**the theoretical side The basic elements of a laser Laser beam characteristics The interaction of light with matter**	Student understanding of the lesson	3 n	**the first And the second And the third**
Daily and monthly tests	theoretical	**the theoretical side Explaining the action of laser in a laser system with three and four energy levels laser level equations at three and four energy levels Types of resonators**	Student understanding of the lesson	3 n	**Fourth fifth And the sixth**
Daily and monthly tests	theoretical	**Semester exam the theoretical side Laser resonator patterns Ray tracing and ABCD transition matrices for the laser resonator and calculating the stability of the resonator**	Student understanding of the lesson	3 n	**Seventh and eighth**
Daily and monthly tests	theoretical	**the theoretical side Calculate the threshold condition for the laser Explain some commonly used types of lasers**	Student understanding of the lesson	3 n	**The ninth and tenth**
Daily and monthly tests	theoretical	**the theoretical side Explain some commonly used types of lasers**	Student understanding of the lesson	3 n	**eleventh And the twelfth**
Daily and monthly tests	theoretical	**Second semester exam**	Student understanding of the lesson	3n	**Thirteenth**

Daily and monthly tests	theoretical	**the theoretical side Some laser applications, including laser switch operation Key operation**	Student understanding of the lesson	3 n	**fourteenth And the fifteenth**

17. Infrastructure	
	-1Required prescribed books
1-Laser Electronics, Third Edition , JT Verdeyen 2-Laser Physics, 2010 by Milonni by O. Svelto Principles of Laser, Fifth Edition,	) -2Main references (sources
	Recommended books and references (scientific journals, reports) ...,
	B - Electronic references, Internet sites...

18. Course development plan
.Communicating in developing the curriculum based on recent versions of books and references Adopting modern interactive teaching methods. .Activating twinning programs with international universities to learn about modern curricula and teaching methods and exchange experiences

Fourth level: Advanced Mathematical Physics, Phy415

Course description form

Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description.

1.Educational institution	7. University of Basra - College of Science
Scientific department /center	Physics
3. Course name/code	**Advanced Mathematical Physics Phy415**
4.Programs in which it is included	Bachelor's, Master's, Doctorate
5.Available attendance forms	weekly
6.Semester/year	2024-2025
)7.Number of study hours (total	30 credit hours
8.Date this description was prepared	1-9-2024
8. 9.Course objective	
Identify the most important special functions (gamma, beta, and error) and use them to , solve a wide range of limited integrals .Solving the Bessel and Legendre differential equations and their applications in problems of potential and electromagnetic fields. Identify Laplace transforms , their inverses , and theorems and use them in solving electrical circuit problem.	

19. Course outcomes and teachin, learning and evaluation methods
A- Cognitive objectives ✓ **Developing the student's skills in calculating different types of definite integrals using special functions** ✓ **Improving student experiences in solving differential equations** ✓ **Introducing the student to the importance of Laplace transforms in analyzing electrical circuits**
B - The skills objectives of the course . B1 - Acquiring the skill of solving Legendre's equations and Legendre's manifolds. B2 - The ability to solve Laplace's equations
Teaching and learning methods
1.Theoretical lectures and discussions 2.Using educational means (scientific presentations and films)
Evaluation methods
1.Daily tests and laboratory reports Monthly tests 2. 3.Final exams
C- Emotional and value goals The ability to communicate information after presenting it, interpreting it ,and discussing it
Teaching and learning methods
1.Direct explanation and delivery of lectures Presentation **2.Powerpoint** and screen
Evaluation methods
1.Daily tests and laboratory reports 2.Monthly tests 3.Final exams
D - General and qualifying transferable other skills related to employability and personal development skills (other skills related to employability and personal development) the student's mental abilities D1- Developing

20. 12.Infrastructure	
	-1Required prescribed books
-1Methods in Applied Mathematics ,written by Dr. Basil Yacoub Youssef, University of Basra - Iraq, 1989. [2] HJ Weber and GB Arfken , "Essential Mathematical Methods for Physicists", Academic Press, 2003.	-2Main references (sources(
	Recommended books and references (scientific journals, reports(...,
	B - Electronic references, Internet sites...

21. 13.Course development plan
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

Level 4
microwave Phy420
Course description form
Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available.

1. Educational institution	University of Basrah - College of Science
2. Scientific department/center	Physics
3. Course name/code	Microwave Phy420
4. The programs it participates in	Bachelor's
5. Available forms of attendance	weekly
6. Semester/year	2024-2025
7. Number of study hours (total)	30 credit hours
8. Date of description preparing	1-9-2024
9. Course objectives	
A study material that describes an important part of the electromagnetic spectrum, which is microwave waves, and shows the methods of generating them and their applications, discussing their types and ways of transferring them from broadcasting devices to receiving devices.	
10. Course outcomes and teaching, learning and evaluation methods	
A- Cognitive objectives:	
✓ Introducing the student to the electromagnetic spectrum and waves.	
✓ Microwave characteristics and uses of microwaves.	
✓ Microwave propagation patterns.	
B - The skills objectives of the course:	
1- Analyze the transmission line and solve its equation. 2- Solve the wave equation in a circular cross-section waveguide. And study the difference between a circular guide and a rectangular guide.	
Teaching and learning methods:	
1-Theoretical lectures and discussions. 2-Using educational means (scientific presentations and films).	
Evaluation methods:	
1-Daily tests and laboratory reports. 2-Monthly tests. 3- Final exams.	
C- Emotional and value goals	
C1- The ability to communicate information after presenting it, discussing it, and interpreting it. C2- Linking information to the environmental reality and the Earth’s system and the extent of its impact on different organisms.	
Teaching and learning methods	
1--Direct explanation and delivery of lectures. 2- PowerPoint presentation and screen.	

Evaluation methods
1-Daily tests and laboratory reports. 2-Monthly tests. 3- Final exams.
D - Transferable general and qualifying skills (other skills related to employability and personal development).
Developing the student's mental abilities.
11. Course structure

Week	Hours	Required learning outcomes	Name of the unit/topic	Teaching method	Evaluation method
1s, 2nd, 3rd	2-theoretical	The student's understanding of the lesson	The theoretical aspect Introduction to the ectromagnetic spectrum and microwaves. Microwave characteristics and uses of microwaves Microwave valves, generators, microwave transmission lines and their types	Theoretical	Daily and monthly tests
4th, 5th, 6th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Microwave propagation patterns Transmission line analysis, equation solution and study Short circuit transmission line and open circuit transmission line.	Theoretical	Daily and monthly tests
7th, 8th	2-theoretical	The student's understanding of the lesson	Semester exam The theoretical aspect Introduction to waveguides, applications and types of waveguides	Theoretical	Daily and monthly tests
9th, 10th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Rectangular cross-section waveguide and solve its wave equation Solve the wave equation in a circular cross-section waveguide. Study the difference between a circular guide and a rectangular guide.	Theoretical	Daily and monthly tests

11th, 12th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Smith chart	Theoretical	Daily and monthly tests
13th	2-theoretical	The student's understanding of the lesson	Second chapter exam	Theoretical	Daily and monthly tests
14th, 15th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Pathways of microwaves and propagation of microwaves Fresnel zone and distortion factor	Theoretical	

12. Infrastructure	
1- Required prescribed books	
2- Main references (sources)	1- Introduction to microwave theory By H.A. Atwater 2- Foundation for microwave engineering By R.E. Collin 3- Transmission lines and networks Written by Waldersee Johnson.
A - Recommended books and references (scientific journals, reports,...)	
B - Electronic references, Internet sites...	

13. Course development plan
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

Level 4
Advanced solid-state physics Phy428
Course description form
Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available.

1. Educational institution	University of Basrah - College of Science
2. Scientific department/center	Physics
3. Course name/code	Advanced solid-state physics Phy428
4. The programs it participates in	Bachelor's, Master's, Doctorate
5. Available forms of attendance	weekly
6. Semester/year	2024-2025
7. Number of study hours (total)	30 credit hours
8. Date of description preparing	1-9-2024

9. Course objectives

The study of advanced solid state physics, which includes the physical properties of solid matter (metals, semiconductors, insulators), discusses the model of free electrons and electric current when an external field is applied to the participation of electrons in calculating specific heat. It is also an introduction to important concepts of the Fermi surface level, which will be used to refine the method of describing and treating electrical and thermal conductivity in metals. It also explains the traditional model of the free electron gas (classical theory), the quantum theory of free electrons, the perceptual state of the electron gas, and the effect of the magnetic field on the movement of free electrons. Therefore, studying the origin of bands in solid materials is a very important topic that helps us understand the electrical, thermal, and optical properties of solid materials, in addition to knowing the structure of bands. Explaining the alternating electrical conductivity of matter in the presence of an alternating electric field, and this conductivity being closely linked to optical properties, covers the term “photoelectricity” at a range of frequencies, which is not limited to the visible range only, but extends from the high-frequency range to the low-frequency range.

10. Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives:

- ✓ Introduce the student to an introduction to solid-state physics
- ✓ Improving many of the physical properties of some materials, so that new metal alloys can be obtained that are characterized by high resistance to impact loads. The property of electrical conductivity in some semiconductors is also due to the presence of a small amount of impurity atoms. These defects also cause color centers in some materials, which makes them suitable for many technology applications. This is in addition to the connection between photo-luminescence and these impurities.

B - The skills objectives of the course:

1- Acquire the skill of calculating the electrical conductivity of materials.
2- Acquiring the skill of calculating the thermal conductivity of materials.

Teaching and learning methods:

1-Theoretical lectures and discussions.
2-Using educational means (scientific presentations and films).

Evaluation methods:

1-Daily tests and laboratory reports.

2-Monthly tests.
3- Final exams.

C- Emotional and value goals

C1- The ability to communicate information after presenting it, discussing it, and interpreting it.

Teaching and learning methods

1--Direct explanation and delivery of lectures.
2- PowerPoint presentation and screen.

Evaluation methods

1-Daily tests and laboratory reports.
2-Monthly tests.
3- Final exams.

D - Transferable general and qualifying skills (other skills related to employability and personal development).

Developing the student's mental abilities.

11. Course structure

Week	Hours	Required learning outcomes	Name of the unit/topic	Teaching method	Evaluation method
1s, 2nd, 3rd	2-theoretical	The student's understanding of the lesson	The theoretical side Chapter One: Free electrons in metals Introduction, the Drude Model, the electrical conductivity of direct current in metals, the specific resistance of metals, the electronic thermal conductivity of metals. Chapter Two: The quantum theory of free electrons. Introduction, the classical model of the gas of free electrons, the quantum theory of free electrons, the Fermi surface, and calculating the Fermi energy. For metal, the state density of the electron phase, the electronic specific heat of metals, the effect of the Fermi surface on electrical conductivity, thermal conductivity in metals, the movement of electrons in the magnetic field, the Hall	Theoretical	Daily and monthly tests

			effect. Chapter Three: The theory of beams in solid materials Introduction, the origin of beams in solid materials, the periodic potential, the Bloch function, a one-dimensional lattice crystal, the density of the electronic state, actual mass, the concept of positive gaps, the study of the Fermi surface, the anomalous surface phenomenon, the orbital frequency (electron), the magnetic acoustic phenomenon, the phenomenon De Haaz-Fan Alven.		
4th, 5th, 6th	2-theoretical	The student's understanding of the lesson	Solve the problems of the first, second and third chapters.	Theoretical	Daily and monthly tests
7th, 8th	2-theoretical	The student's understanding of the lesson	Semester exam The theoretical aspect Chapter Four: Electrical and optical properties of solid materials, alternating electrical conductivity and optical properties, low-frequency region ($\omega\tau<<1$), high-frequency region ($\omega\tau>>1$), thermal ion emission.	Theoretical	Daily and monthly tests
9th, 10th	2-theoretical	The student's understanding of the lesson	the theoretical side Solve the problems of Chapter Four Chapter Five: Introduction to crystal defects, point defects, point defects in ionic crystals, Schottky voids, Frenkel voids. Other types of point defects, linear defects, edge dislocations, twisted dislocations, Perker	Theoretical	Daily and monthly tests

			vector and circle, planar defects, defects resulting from packing errors, free surfaces		
11th, 12th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Other types of point defects, linear defects, edge dislocations, twisted dislocations, Perker vector and circle, planar defects, defects resulting from packing errors, free surfaces	Theoretical	Daily and monthly tests
13th	2-theoretical	The student's understanding of the lesson	Second semester exam	Theoretical	Daily and monthly tests
14th, 15th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Other types of point defects, linear defects, edge dislocations, twisted dislocations, Perker vector and circle, planar defects, defects resulting from packing errors, free surfaces	Theoretical	Daily and monthly tests

12. Infrastructure	
1- Required prescribed books	
2- Main references (sources)	1- Solid State Physics, written by Dr. Sobhi Saeed Al-Rawi 2- Introduction to solid state physics authorship by Charles Kittel.
A - Recommended books and references (scientific journals, reports,...)	
B - Electronic references, Internet sites...	

13. Course development plan
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences

Level 4
Molecular physics Phy437
Course description form
Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available.

1. Educational institution	University of Basrah - College of Science
2. Scientific department/center	Physics
3. Course name/code	Molecular physics Phy437
4. The programs it participates in	Bachelor's degree, Master's degree
5. Available forms of attendance	weekly
6. Semester/year	2024-2025
7. Number of study hours (total)	30 credit hours
8. Date of description preparing	1-9-2024
9. Course objectives	
Calculating the rotational, vibrational and molecular electronic transition spectra	
10. Course outcomes and teaching, learning and evaluation methods	
A- Cognitive objectives:	
✓ Introduce the student to an introduction to molecular physics. ✓ Introducing the student to how the molecular rotation spectrum arises because of the movement of atoms bonded together within the molecule around a specific axis. ✓ Study of particles that are classified as a symmetrical rigid rotor, which has a moment of inertia different from the linear and spherical case. ✓ Identify the nature of molecular vibration. Molecular vibration, which represents the change in the length of bonds between neighboring atoms in a single molecule, as if this process occurs within a limited range between the two atoms in proximity.	
B - The skills objectives of the course:	
1- Acquire the skill of recognizing the details of molecular physics.	
Teaching and learning methods:	
1-Theoretical lectures and discussions. 2-Using educational means (scientific presentations and films).	
Evaluation methods:	
1-Daily tests and laboratory reports. 2-Monthly tests. 3- Final exams.	
C- Emotional and value goals	
C1- The ability to communicate information after presenting it, discussing it, and interpreting it. C2- Linking information to the environmental reality and the Earth's system and the extent of its impact on different organisms.	
Teaching and learning methods	
1--Direct explanation and delivery of lectures. 2- PowerPoint presentation and screen.	
Evaluation methods	
1-Daily tests and laboratory reports. 2-Monthly tests.	

3- Final exams.

D - Transferable general and qualifying skills (other skills related to employability and personal development).

Developing the student's mental abilities.

11. Course structure

Week	Hours	Required learning outcomes	Name of the unit/topic	Teaching method	Evaluation method
1s, 2nd, 3rd	2-theoretical	The student's understanding of the lesson	The theoretical aspect Rotational spectrum Rotational movement of particles Rotational energy levels	Theoretical	Daily and monthly tests
4th, 5th, 6th	2-theoretical	The student's understanding of the lesson	The theoretical aspect The particles are like a solid, spherical rotor Molecules as a symmetrical rigid rotor Centrifugal deformation	Theoretical	Daily and monthly tests
7th, 8th	2-theoretical	The student's understanding of the lesson	Semester exam The theoretical aspect Molecular vibration spectrum	Theoretical	Daily and monthly tests
9th, 10th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Convergence of energy levels Rotational vibration.	Theoretical	Daily and monthly tests
11th, 12th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Electronic transfers	Theoretical	Daily and monthly tests
13th	2-theoretical	The student's understanding of the lesson	Second chapter exam	Theoretical	Daily and monthly tests
14th, 15th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Fibrotic transfers Why electronic composition?	Theoretical	

12. Infrastructure

1- Required prescribed books	
2- Main references (sources)	1- Atoms, Molecules and Photons: An Introduction to Atomic, Molecular and Quantum Physics by Wolfgang Demtröder 2- ASTRONOMICAL SPECTROSCOPY; An Introduction to the Atomic and Molecular Physics of Astronomical Spectra by JONATHAN TENNYSON

A - Recommended books and references (scientific journals, reports,...)	
B - Electronic references, Internet sites...	
13. Course development plan	
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences	

Level 4
Plasma physics Phy447
Course description form
Course description

This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available.

1. Educational institution	University of Basrah - College of Science
2. Scientific department/center	Physics
3. Course name/code	Plasma physics Phy447
4. The programs it participates in	Bachelor's, Master's, Doctorate
5. Available forms of attendance	weekly
6. Semester/year	2024-2025
7. Number of study hours (total)	30 credit hours
8. Date of description preparing	1-9-2024
9. Course objectives	
Study of how plasma is formed and its most important applications.	
10. Course outcomes and teaching, learning and evaluation methods	
A- Cognitive objectives:	
✓ Introducing the student to an introduction to states of matter, including the fourth state, which is plasma.	
B - The skills objectives of the course:	
1- Acquire the skill of knowing the details of the fourth state of matter, which is plasma.	
Teaching and learning methods:	
1-Theoretical lectures and discussions. 2-Using educational means (scientific presentations and films).	
Evaluation methods:	
1-Daily tests and laboratory reports. 2-Monthly tests. 3- Final exams.	
C- Emotional and value goals	
C1- The ability to communicate information after presenting it, discussing it, and interpreting it. C2- Linking information to the environmental reality and the Earth's system and the extent of its impact on different organisms.	
Teaching and learning methods	
1--Direct explanation and delivery of lectures. 2- PowerPoint presentation and screen.	
Evaluation methods	
1-Daily tests and laboratory reports. 2-Monthly tests. 3- Final exams.	
D - Transferable general and qualifying skills (other skills related to employability and personal development).	
Developing the student's mental abilities.	
11. Course structure	

Week	Hours	Required learning outcomes	Name of the unit/topic	Teaching method	Evaluation method
1s, 2nd, 3rd	2-theoretical	The student's understanding of the lesson	The theoretical aspect Plasma sources Plasma properties Plasma applications	Theoretical	Daily and monthly tests
4th, 5th, 6th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Plasma and environment Semester exam Velocity distribution of plasma components	Theoretical	Daily and monthly tests
7th, 8th	2-theoretical	The student's understanding of the lesson	Semester exam Saha equation Plasma properties	Theoretical	Daily and monthly tests
9th, 10th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Movement of charged particles in fields	Theoretical	Daily and monthly tests
11th, 12th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Plasma drift Magnetic mirrors	Theoretical	Daily and monthly tests
13th	2-theoretical	The student's understanding of the lesson	Second chapter exam	Theoretical	Daily and monthly tests
14th, 15th	2-theoretical	The student's understanding of the lesson	The theoretical aspect Electromagnetic waves in plasma, Alphen waves.	Theoretical	

12. Infrastructure	
1- Required prescribed books	
2- Main references (sources)	1- Plasma Physics - Dr. Assem Abdel Karim Ezzo 2- Plasma physics and its applications - Dr. Jamal Jaber.
A - Recommended books and references (scientific journals, reports,...)	
B - Electronic references, Internet sites...	

13. Course development plan
Communicating in developing the curriculum based on recent versions of books and references. Adopting modern interactive teaching methods. Activating twinning programs with international universities to learn about modern teaching curricula and methods and exchange experiences