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

Academic Program and Course Description Guide

2024

Introduction:

The educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

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

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

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

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

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

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

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

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

Academic Program Description Form

University Name: University of Baghdad
Faculty/Institute: College of Science
Scientific Department: Physics
Academic or Professional Program Name: Bachelor of Physics
Final Certificate Name: Bachelor of Physics
Academic System: semester
Description Preparation Date: 1-10-2024
File Completion Date: 1-10-2024

Signature:
Head of Department Name:
Assist. Prof. Dr. Omar Abdulsada Ali
Date:

عمر عبدالسادة علي
رئيس قسم الفيزياء

Signature:
Scientific Associate Name:
Prof. Dr. Namir I. A. Haddad
Date:

الأستاذ الدكتور
نمير ابراهيم عبدالله
معاون العميد للشؤون العلمية والدراسات العليا

The file is checked by: Prof. Dr. Israa Ali Zaidan
Department of Quality Assurance and University Performance
Director of the Quality Assurance and University Performance Department:
Date:
Signature:

Approval of the Dean:
Prof. Dr. Raed Falih Hassan

1. Program Vision

The College of Science seeks to prepare graduates in the field of physical sciences to work in government departments and benefit from specialization in the practical and applied field

2. Program Mission

Working to prepare and graduate leading scientific and leadership competencies in the field of physics and to develop the balance of knowledge in the field of branches of physics to serve the local, regional and international community, as well as training and refining the minds of students scientifically and cognitively, emphasizing social and cultural values and responding to the requirements of the local market.

3. Program Objectives

1- Understand and understand physics, solve physics problems, and develop solutions to them.

2- Dealing with physical problems and developing solutions to them

3- Understanding mathematical methods and techniques in solving problems in physical sciences

4. Program Accreditation

Does the program have program accreditation? And from which agency? **Nothing**

5. Other external influences

Is there a sponsor for the program? **Nothing**

6. Program Structure				
Program Structure	**Number of Courses**	**Credit hours**	**Percentage**	**Reviews***
Institution Requirements	3	5		Basic
College Requirements	1	2		Basic
Department Requirements	28	58		Basic
	4	8		Elective
Summer Training	**Yes**			
Other				

* This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			Theoretical	Practical
Third/ First Course	PNA 211	Numerical analysis	2	2
Third/ First Course	PM 307	Material physics (1)	2	2
Third/ First Course	PO 301	Geometrical Optics	2	2
Third/ First Course	PQM 303	Quantum Mechanics (1)	2	-
Third/ First Course	PLP 305	Laser Physics I	2	2
Third/ First Course	PES 313	Elective Subject (1)	2	-
	PES 313-1	Physics of Light	2	-
	PES 313-2	Polymer Application	2	-
	PES 313-3	Biomaterials and Bio Compatibility	2	-
Third/ First Course	EN 314	English language (3)	2	-
Third/ Second Course	PMa 310	Mathematics (5)	2	-
Third/ First Course	PO 302	Physical Optics	2	2
Third/ First Course	PQM 304	Quantum Mechanics II	2	-
Third/ First Course	PM 309	Material physics (2)	2	2
Third/ First Course	PLP 306	Laser Physics (2)	2	2
Third/ First Course	PMoP 312	Molecular Physics	2	-
	PES 314	Elective Subject (2)	2	-
	PES 314-1	Medicine Physics	2	-
Third/ First Course	PS 311	Spectra	2	-
Third/ First Course	UOB 309	Research Methodology	1	-
Fourth/ Second Course	PMaP 409	Mathematical Physics	3	-
Fourth/ Second Course	PNP 401	Nuclear Physics I	2	-
Fourth/ Second Course	PQM 407	quantum mechanics III	2	-
Fourth/ Second Course	PET 405	Electromagnetic Theory I	2	-
Fourth/ Second Course	PES 411	Elective Subject III	2	-

Fourth/ Second Course	PES 411-1	Nanotechnology I	2	-
Fourth/ Second Course	PSS 403	Solid State Physics I	2	-
Fourth/ Second Course	PPP 421	Practical Physics VII Nuclear Physics Solid State Physics Virtual Lab		6 Hrs. 2hrs/every lab
Fourth/ Second Course	EN 414	English language	2	-
Fourth/ Second Course	PRP 413	Research Project I	2	-
Fourth/ Second Course	PNP 402	Nuclear Physics II	2	-
Fourth/ Second Course	PPaP 410	Plasma Physics	2	-
Fourth/ Second Course	PQM 408	quantum mechanics IV	2	-
Fourth/ Second Course	PSS 404	Solid State Physics II	2	-
Fourth/ Second Course	PRP 414	Research Project II	2	-
Fourth/ Second Course	PES 412	Elective Subject IV	2	-
Fourth/ Second Course	PES 412-1	Nanotechnology II	2	-
Fourth/ Second Course	PET 406	Electromagnetic Theory II	2	-
Fourth/ Second Course	PPP 422	Practical Physics VIII Nuclear Physics Solid State Physics Virtual Lab		6 Hrs. 2hrs/every lab

8. Expected learning outcomes of the program

Knowledge	
	1. Keeping pace with the development of physics according to the requirements of the labor market 2. Communicate with and develop everything that is new or useful
Skills	
	1. The ability to understand physics and apply it practically. 2. Dealing with crises and physical problems. 3. Building mathematical and quantitative foundations for students in the Physics Department
Ethics	
	Developing students' abilities to share ideas

9. Teaching and Learning Strategies

1- Explaining the scientific material to students in detail.

2- Students' participation in solving mathematical problems

3- Discussion and dialogue about vocabulary related to the topic

10. Evaluation methods

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

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)		Number of the teaching staff	
	General	Special			Staff	Lecturer
Professor (11)	physics	Thin films			**Staff**	
Professor (7)	physics	Nuclear			**Staff**	
Professor (4)	physics	Laser and molecular			**Staff**	
Professor (6)	physics	Laser and Electro optics			**Staff**	
Professor (14)	physics	Materials			**Staff**	
Professor (6)	physics	Plasma			**Staff**	
Assistant Professor (8)	physics	Thin films			**Staff**	
Assistant Professor (5)	physics	Nuclear			**Staff**	
Assistant Professor (4)	physics	Laser and molecular			**Staff**	
Assistant Professor (11)	physics	Laser and Electro optics			**Staff**	
Assistant Professor (3)	physics	Materials			**Staff**	

Assistant Professor (1)	physics	Plasma			**Staff**	
Lecturer (3)	physics	Thin films			**Staff**	
Lecturer (8)	physics	Nuclear			**Staff**	
Lecturer (2)	physics	Laser and molecular			**Staff**	
Lecturer (1)	physics	Laser and Electro optics			**Staff**	
Lecturer (1)	physics	Materials			**Staff**	
Lecturer (4)	physics	Plasma			**Staff**	
Assistant teacher (2)	physics	Thin films			**Staff**	
Assistant Lecturer (2)	physics	Nuclear			**Staff**	
Assistant Lecturer (5)	physics	Laser and molecular			**Staff**	
Assistant lecturer (2)	physics	Laser and Electro optics			**Staff**	
Assistant Lecturer (6)	physics	Materials			**Staff**	
Assistant Lecturer (3)	physics	Plasma			**Staff**	

Professional Development

Mentoring new faculty members

To orient new faculty members, you need to:

1. Guidance and training program: There must be an integrated program to guide and train them on the policies and procedures of the educational institution, effective teaching methods, the use of technology in education, and dealing with students and parents.
2. Educational materials: The necessary educational materials must be provided to help them prepare and deliver lessons effectively.
3. Technical support: There should be technical support available to them in case they encounter technical problems while using technology in education.
4. Reviews and evaluation: Periodic reviews and evaluation of their performance should be provided to identify strengths and weaknesses and provide the necessary guidance and support.
5. Administrative support: They need administrative support to help manage daily business and administrative procedures.

6. Professional development opportunities: Opportunities for professional development and continuous training should be provided to members of the teaching staff to develop their skills and keep pace with the latest innovations in the field of education. Leadership presence: There must be a leadership presence to support, guide and motivate them to achieve their educational goals.

Professional development of faculty members

For professional development of faculty members, the following elements must be provided:

1. Training programs and workshops: Providing training programs and workshops in various fields such as modern teaching techniques, curriculum development, educational evaluation, and personal and social skills development.
2. Online learning opportunities: Providing easy and flexible access to online educational courses in various areas such as educational technology, language skills development, and classroom management.
3. Participation in conferences and seminars: Encouraging faculty members to participate in local and international conferences and seminars to exchange experiences and knowledge and follow the latest innovations in the field of education.
4. Performance evaluation and feedback: Providing effective mechanisms to evaluate the performance of faculty members and provide them with feedback to identify strengths and weaknesses and identify areas in which they need development.
5. Motivational and encouragement programs: Create motivational programs that encourage faculty members to continue learning and achieve professional development.
6. Individual guidance: Providing individual guidance sessions for faculty members to discuss their career goals and determine the steps necessary to achieve them.
7. Providing leadership opportunities: Providing opportunities to participate in administrative and leadership activities within the educational institution, which helps them develop leadership and organizational skills.
8. Constructive communication with the Continuing Education Division

12. Acceptance Criterion

The student must have a preparatory certificate within the scientific stream

13. The most important sources of information about the program

1. Fundamentals of Physics, by Halliday, Resnick and Wallker.
2. Fundamentals of Physics Extended, 10th Edition, David Halliday, Robert Resnick, Jearl Walker. August 2013.
3. M. Russell Wehr and James A. Richards "The physics of the atom"
4. Mark Waldo Zemansky_ Richard Dittman - Heat and thermodynamics _ an intermediate textbook (1997, McGraw-Hill
5. Electronic devices by Thomas L. Floyed
6. Physics of atoms and molecules, B.H. Bransden and C. J. Joachain
7. Introduction to modern optics by G. Fowels.
8. Introduction to Quantum Mechanics, D. J. Grifiths , second Edition.
9. Nuclear Physics Concepts, By Meyerhof.
10. Introduction to solid state physics by Charles Kittel
11. Introduction to Electrodynamics, by David Griffiths, Prentice-Hall, 1999.
12. Nanotechnology and Nanoelectronics, W.R. fahrener, materials, devices, techniques.
13. Introduction to Plasma Physics and Controlled Fusion, Third Edition, by F.F. Chen, 2016.

14. Program Development Plan

The first stage: assessment of the current situation

1. Conduct a comprehensive evaluation of the current academic program of the Department of Physics.
2. Identify the strengths, weaknesses, opportunities and challenges of the current program.
3. Conduct a survey of the opinions of students, program graduates, and faculty members to determine the areas in which the program needs development.

The second stage: setting goals and priorities

1. Setting specific and measurable goals for developing the academic program.
2. Identify priorities and key areas to focus on to improve the program.

The third stage: planning and implementation

1. Developing updated educational curricula that include the latest developments and technologies in the field of physical science technologies.
2. Create new educational courses covering modern and advanced topics in physical sciences.
3. Develop practical and laboratory training programs that allow students to apply theoretical concepts in a practical environment.
4. Modernizing and developing laboratory facilities and equipment to be compatible with the latest technologies and standards in the field.
5. Providing external learning opportunities through field visits to the laboratories and facilities of the Physics Department.

The fourth stage: evaluation and follow-up

1. Evaluate the developed program using specific evaluation metrics and indicators.
2. Collect feedback from students, faculty, and employers on the effectiveness of the changes introduced.
3. Make additional adjustments and improvements based on evaluation results and feedback.

The fifth stage: continuity and continuous development

1. Establishing mechanisms for continuous monitoring and evaluation of the program's performance and ensuring continuity of development.
2. Providing continuous training opportunities for faculty members to maintain their knowledge of the latest developments in the field of physical sciences.
3. Continuous communication with employers to ensure that the program is updated in line with the needs of the labor market and technological developments in the field.

Program Skills Outline

Year/Level	Course Code	Course Name	Basic or optional	Required program Learning outcomes											
				Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
Third /First Course	PNa 308	Numerical analysis	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /First Course	EN 314	English Language	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /First Course	PO 301	Geometrical Optics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /First Course	PQM 303	Quantum Mechanics (1)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /First Course	PLP 305	Laser Physics (1)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /First Course	PES 313	Elective Subject (1)	Elective	√	√	√	√	√	√	√	√	√	√	√	√
Third /First Course	PES 313-1	Physics of Light	Elective	√	√	√	√	√	√	√	√	√	√	√	√
Third /First Course	PES 313-2	Polymer Application	Elective	√	√	√	√	√	√	√	√	√	√	√	√
	PES 313-3	Biomaterials and Bio Compatibility	Elective	√	√	√	√	√	√	√	√	√	√	√	√
Third /First Course	PM 307	Material physics (1)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /Second Course	PMa 310	Mathematics (5)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /Second Course	PO 302	Physical Optics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /Second Course	PQM 304	Quantum Mechanics (2)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /Second Course	PM 309	Material physics (2)	Basic	√	√	√	√	√	√	√	√	√	√	√	√

Third /Second Course	PLP 306	Laser Physics (2)	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /Second Course	PMoP 312	Molecular Physics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /Second Course	PES 314	Elective Subject (2)	Elective	√	√	√	√	√	√	√	√	√	√	√	√
	PES 314-1	Medicine Physics	Elective	√	√	√	√	√	√	√	√	√	√	√	√
Third /Second Course	PS 311	Spectra	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third /Second Course		Research Methodology	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /First Course	PMaP 409	Mathematical Physics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /First Course	PNP 401	Nuclear Physics I	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /First Course	PQM 407	Quantum Mechanics III	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /First Course	PET 405	Electromagnetic Theory I	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /First Course	PES 411	Elective Subject III	Elective	√	√	√	√	√	√	√	√	√	√	√	√
	PES 411-1	Nanotechnology I	Elective	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /First Course	PRP 413	Research Project I	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /First Course	PSS 403	Solid State Physics I	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /First Course	PPP 421	Practical Physics VII Nuclear Physics, Solid State Physics Virtual Lab	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /Second Course	PNP 402	Nuclear Physics II	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /Second Course	PPaP 410	Plasma Physics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /Second Course	PQM 408	Quantum Mechanics IV	Basic	√	√	√	√	√	√	√	√	√	√	√	√

Fourth /Second Course	PSS 404	Solid State Physics II	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /Second Course	PRP 414	Research Project II	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /Second Course	PES 412	Elective Subject IV	Elective	√	√	√	√	√	√	√	√	√	√	√	√
	PES 412-1	Nanotechnology II	Elective	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /Second Course	PET 406	Electromagnetic Theory II	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth /Second Course	PPP 422	Practical Physics VIII Nuclear Physics Solid State Physics Virtual Lab	Basic	√	√	√	√	√	√	√	√	√	√	√	√

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluatio**

Third Stage
First Semester

]

Course Description Form

1. Course Name:
Geometrical Optics
2. Course Code:
PO 301
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Practical - 3 Units
7. Course administrator's name (mention all, if more than one name)
• Prof. Dr. Hamad Rahim Hamad • Prof. Dr. Osama Natiq Naji • Asst. Prof. Dr. Omar Adnan Ibrahim
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future

	- Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	**Nature of light**	**Nature of light ,Historical review,Wave front and rays,Huygens principle,The electromagnetic spectrum , Source of electromagnetic waves**	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		**The wave nature of light, Electric constant and speed of light,Speed of light in a medium Plane harmonic waves and phase velocity, Plane harmonic waves in 1- D, Plane harmonic waves 3-D**	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours		**alternative ways of representing harmonic eaves, group velocity , electromagnetic theory (Maxell equation), transverse waves, independence of electric and magnetic field, energy density and flow, examples**	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	**reflection and refraction**	**reflection and refraction reflection and refraction ,low of reflection and refraction , Fresnel's formulae Reflected and transmitted energy, Normal incident**	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		**Total internal reflection, Reflection from conductor**	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	**the superposition the superposition of waves**	**the superposition the superposition of waves ,addition of simple harmonic motion along the same line superposition of many waves with random phase, addition of simple harmonic motions at right angles**	Theoretical	Daily quizzes, monthly tests, and reports

7	2 hours	**Monthly Exam**	**Exam**		
8	2 hours	**interference**	- **interference of two beams of light , introduction, Coherent (time of space), coherent sources, theory of partial coherent , visibility of fringes**	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	**Billets split lens**	**interference fringes from double source young's experiment, Fresnel's Biprisim**	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	**Michelson interferometer**	**Billets split lens, Lloyds Bimirror, Fresnel's Bimirror, intensity distribution in the fringes system, Application of interference**	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	**interference involving multiple reflection**	**Michelson interferometer, Circular and localized fringes, Application of Michelson interferometer Measurement of wavelength, Measurement of wavelength different, Measurement of refractive indices or thickness for plate, Measurement of length**	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	**diffraction Phenomena**	**interference involving multiple reflection introduction , reflection from parallel films, . Airy function, Fabry- Perot interferometer , chromatic resolving power of Fabry -Perot instruments, Newtons rings, theory of multilayer films, Antireflection films, high reflection films, Fabry-Perot nterferometer filter. Examples**	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	**optical resolution**	**diffraction Phenomena general description of diffraction, fundamental theory ,the Fresnel - Kirchhoff formula, fraunhofer and Fresnel formula , Fraunhofer diffraction patterns, the single slit,** - **the rectangular aperture the circular aperture**	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	**Monthly Exam**	**optical resolution , the double slits, multiple slits -diffraction gratings, resolving power of grating, position of maxima and minima missing orders, comparison of the single slit and double slit pattern, Fresnels Zones, Zone plate, rectangular aperture**	Theoretical	Daily quizzes, monthly tests, and reports

15	2 hours	**polarization**	**polarization nature of light, the polarization of light, methods of producing polarization , types of polarization , linear polarization , circular polarization , Elliptical polarization, polarization angle and Brewster law -**		
16					

11. Course Evaluation	
Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	**Introduction to modern optics by G. Fowels**
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Laser Physics I
2. Course Code:
PLP305
3. Semester / Year:
First semester / 2024-2025

4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical – 2 Practical – 3 Units
7. Course administrator's name (mention all, if more than one name)
Asst. Prof. Dr. Iman Karim Hassan Asst. Prof. Dr. Sarmed Saleh

8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter One	Introduction; Electromagnetic Radiation; the definition of Frequency; wavelength; amplitude; speed; the tupe of electromagnetic waves; Radio waves; uses; Micro waves; uses; Infrared radiation; uses; Visible light; Ultraviolet; uses; X-rays; uses; Gamma rays; uses; summary	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Chapter One	The development of the atomic model; Timeline: 400 BC Scientist: Democritus (Greek Philosopher); Timeline: 1800's Scientist: John Dalton; Timeline: 1890's Scientist: J.J Thomson; ATOMIC MODEL of THOMSON'S: Timeline: 1910's Scientist: Ernest Rutherford; ATOMIC of MODEL RUTHERFORD'S ; Timeline: 1910's Scientist: Niels Bohr; ATOMIC MODEL of BOHR'S; Timeline:1920's Scientist: Erwin Schrödinger; ATOMIC MODEL of SCHRÖDINGER'S; SUMMARYThe development of the atomic model; Timeline: 400 BC Scientist: Democritus (Greek Philosopher); Timeline: 1800's Scientist: John Dalton; Timeline: 1890's Scientist: J.J Thomson; ATOMIC MODEL of THOMSON'S: Timeline: 1910's Scientist: Ernest	Theoretical	Daily quizzes, monthly tests, and reports

			Rutherford; ATOMIC of MODEL RUTHERFORD'S ; Timeline: 1910's Scientist: Niels Bohr; ATOMIC MODEL of BOHR'S; Timeline:1920's Scientist: Erwin Schrödinger; ATOMIC MODEL of SCHRÖDINGER'S; SUMMARY		
3	2 hours	Chapter One	Laser Spectrum; Introduction (Brief history of laser); Noble prize for laser and laser applications; A laser consists of three parts; Laser matter interaction; Blackbody radiation; The effect of the energy quantization	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter One	Fundamental of Light-Matter Interaction; Interaction of Radiation with Atoms and Molecules:The two- level system; Boltzmann population factors Problem; Absorption; Spontaneous & stimulated Emission and its rate equations Laser; Problems; Summary	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Chapter One	THE LASER IDEA; Problem; PUMPING SCHEMES; Three Level Four Level Laser; Advantages of four level lasers Compared to three level lasers; Summary	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Chapter One	PROPERTIES OF LASER BEAMS; Monochromaticity; Coherence; Directionality; Brightness; Problem	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		**First Exam**		
8	2 hours		Optical Resonator;	Theoretical	Daily quizzes,

		Chapter Two	Definition; passive optical resonators ; Standing waves; Resonator Configurations (types); Plan-Parallel resonator(Fabry-Perot)advantage & disadvantage; Concentric (Spherical) resonator advantage & disadvantage; Confocal resonator advantage & -disadvantage;		monthly tests, and reports
9	2 hours	Chapter Two	Resonators using a combination of plane & spherical mirrors; Stable Resonator; Unstable Resonator; plane- parallel resonator; The properties and propagation of a Gaussian laser beam; Generalized Spherical Resonator;	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	Chapter Two	The stability condition of the resonator; The stability condition of (1) Plane-Parallel resonator (2) Concentric Resonator (3) Confocal Resonator; schematic diagram of stability condition; Examples; Problems	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Chapter Two	Second Exam	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter Three	Laser Pumping Methods/ Methods of Achieving Population Inversion; Pumping process; Definition; Optical pumping; Electrical pumping; Chemical pumping; Gas-dynamic pumping; Opticalpumping; pulsed laser; continuous wave; the type of lamps.	Theoretical	Daily quizzes, monthly tests, and reports

13	2 hours	Chapter Three	types of pumping efficiency; Transfer efficiency; Lamp radiative efficiency; Pump quantum efficiency; Pump light distribution; Pumping -rate.	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter Three	ELECTRICAL PUMPING; Electron Impact Excitation; Pump Rate and Pump Efficiency; Excitation by (Near) resonant Energy Transfer; Chemical pumping	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Electromagnetic Radiation ,The development of the atomic model, Chapter One	Re- Exam of the First month -		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Principles of Lasers ,O.Svelto, 2nd Edition , Plenum Press . New York and London , 1998.	
1- Laser and their applications, M .J. Beesley, Taylor & Francis LTD, 1976. 2- Introduction to optical electronics, Amnon Yariv, Holt Richard Winston, 1976.	
Principles of Lasers ,O.Svelto, 2nd Edition , Plenum Press . New York and London , 1998.	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Laser Lab.
2. Course Code:
PPP 321
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical – 2 Practical – 3 Units
7. Course administrator's name (mention all, if more than one name)
Asst. Prof. Dr. Sarmed Saleh Mahdi Asst. Omar Shaker Shafiq Asst. Ahmed Kilo Hashoosh
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly

	qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	An introductory lecture about the laser laboratory	Introducing the student to the most important basics of the laser laboratory and the most important phenomena related to laser production and the interaction of the laser with matter.		Daily quizzes, monthly tests, and reports
2	2 hours	Safety rules in laser labs	Introducing students to the most important safety instructions and the most important procedures that students must follow when dealing with laser beams.		Daily quizzes, monthly tests, and reports
3	2 hours	Divergence angle of laser beam	To study one of the characteristics of a laser beam: Beam divergence	practical	Daily quizzes, monthly tests, and reports
4	2 hours	Diffraction grating by using laser	The experiment aim is to determine the wavelength of laser beam with a transmission grating.	practical	Daily quizzes, monthly tests, and reports
5	2 hours	Compact Disk as a diffraction grating	Using interference of Diode Laser light (of a known wavelength) reflected off a Compact Disk (CD), to find (verify) the distance (**d**)	practical	Daily quizzes, monthly tests, and reports

			between the grooves of the CD.		
6	2 hours	Measurement the diameter of pin hole by using laser	Measuring thin wires thickness. Using the phenomenon of diffraction of laser light incident on thin wire, we can calculate their diameters, using the known wavelength of the diode laser. b. Measuring unknown wavelength of a laser.	practical	Daily quizzes, monthly tests, and reports
7	2 hours	Measurement the diameter of single slit by using laser	Measuring small apertures. Using the phenomenon of diffraction of laser light through a pinhole and a single slit, we can calculate their diameters, using the known wavelength of the diode laser. b. Measuring unknown wavelength of a laser. Using the measured diameter of the pinhole, we can calculate the diode laser wavelength. Equipment for	practical	
8	2 hours	IV characteristics curve of semiconductor laser	To study the shape of the I-V Curve of a Laser Diode and LED. To find the "Turn -ON" voltages of the Laser Diode and LED. To find the Lasing threshold voltage of the Laser Diode. □ To find the dependence of the emitted laser power, as a function of the applied voltage for the Laser Diode and LED. -	practical	Daily quizzes, monthly tests, and reports
9	2 hours	Diffraction phenomena	General description of diffraction Fundamental theory The Fresnel – Kirchhoff formula Fraunhofer and Fresnel	practical	Daily quizzes, monthly tests, and reports

			diffraction		
10	2 hours	Review experiments	A general review of the most important theoretical and practical principles of laser laboratory experiments		Daily quizzes, monthly tests, and reports
11	2 hours				
12	2 hours		exam		
13	2 hours		-		
14	2 hours			Theoretical	
15	2 hours		-		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	References: 1. Halliday, Resnick and Walker; Fundamentals of Physics; 8th edition 2008. 2. F. Sears, Addison-Wesley publishing company, Optics 1964 . F. Jenkins& H. White, Fundamentals of Optics by, McGraw Hill book company, 4th edition, 1985.
Main references (sources)	Miles V. Klein and Thomas E. Furtak, Optics, 2nd ed. 1986.
Recommended books and references (scientific journals, reports…)	Justin Peatross and Michael Ware, Physics of light and optics, 2015 https://optics.byu.edu/docs/OpticsBook.pdf
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Quantum Mechanics I
2. Course Code:
PQM 303
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical – 2 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Wasan Zuhair Majeed Prof. Dr. Ahmed Najm
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1	**The origin of quantum Mechanic, shortcomings of the old quantum theory**	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		**The uncertainty and Complementary principles, the wave-particle duality**	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours		**Derivation of Schrödinger equation, Interpretation of the wave function**	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours		**Properties of the wave function, probability, normalization, probability current density, applications**	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Chapter 2	**Time-independent Schrödinger equation, stationary states**	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		**Simultaneous eigen functions, eigen values and eigen functions**	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		**exam**		
8	2 hours	Chapter3	**-Degeneracy, Hermitian operator, expectation values-Variance, Deviations, and Dirac bracket**	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours		**notation**	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours		**Commute Operators, Ehrenfest Theorem**	Theoretical	Daily quizzes, monthly tests,

					and reports
11	2 hours		**Solutions of some one-Dimensional Systems, Potential Step**	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter 4	**The square well potential, Infinite square well potential**	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours		**-Schrödinger equation in three coordinates**	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours		**Exam**	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours		**-The Hydrogen atom, angular momentum,**		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Quantum Mechanics, D. J. Grifiths , second Edition.
Main references (sources)	Introduction to quantum mechanics, Dick and Wittike Introduction to quantum mechanics, D. Park
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Numerical analysis
2. Course Code:
PNA 211
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical – 2 Practical – 3 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Saba Jawad Kadhem Asst. Aseel Amer Hassan
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future

	- Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Introduction	Introduction of numerical analysis	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	**Errors**	Errors	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours		Types of Errors	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours		Bisection method	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		Newton –Raphson method	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		Requla Falsi method (Flase position)	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		exam1		
8	2 hours		-Linear Fitting	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Principle of least square	Principle of least square	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours		Euler method	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours		Modern Euler method	Theoretical	Daily quizzes,

					monthly tests, and reports
12	2 hours		Rung-Kutta method	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours		-Rectangle method	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours		trapezoid method and Simpson method	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours		-exam 2		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Numerical Recipes: The Art of Scientific Computing" by William H. Press, Saul A. Teukolsky, William T. Vetterling, and Bria P. Flannery.
Main references (sources)	"Numerical Analysis" by Richard L. Burden and J. Douglas Faires.
Recommended books and references (scientific journals, reports…)	المصدر كتاب التحليل العددي (علي سيفي)
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Numerical analysis Lab.
2. Course Code:
PPP 321
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical – 2 Practical – 3 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Saba Jawad Kadhem Asst. Prof. Aseel Amer Hassan
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours		Vector analysis (vector and scalar)+vector algebra+ laws of vector algebra+unit vector+rectangular unit vectors+components of vector+	practical	Daily quizzes, monthly tests, and reports
2	2 hours		The non-colinear vectors+ problems+scalar fields+vector fields	practical	Daily quizzes, monthly tests, and reports
3	2 hours		Solved Problems	practical	Daily quizzes, monthly tests, and reports
4	2 hours		The dot and cross product	practical	Daily quizzes, monthly tests, and reports
5	2 hours		Solved Problems	practical	Daily quizzes, monthly tests, and reports
6	2 hours		Triple products+problems+reciprocal sets of vectors	practical	Daily quizzes, monthly tests, and reports
7	2 hours		Solved Problems	practical	
8	2 hours		-Vector differentiation+ differentiation formulas+partial derivatives of vectors+differential od vectors	practical	Daily quizzes, monthly tests, and reports
9	2 hours		Solved Problems	practical	Daily quizzes, monthly tests, and reports

10	2 hours		Gradient+divergence+curl	practical	Daily quizzes, monthly tests, and reports
11	2 hours		Solved Problems	practical	Daily quizzes, monthly tests, and reports
12	2 hours		Vector integration(line integrals)	practical	Daily quizzes, monthly tests, and reports
13	2 hours		-Surface integrals	practical	Daily quizzes, monthly tests, and reports
14	2 hours		Solved Problems	practical	Daily quizzes, monthly tests, and reports
15	2 hours		-Volume integrals& Solved Problems		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	References: 1- H. J. Weber And G. B. Arfken "Essential Mathematical Methods For Physicists,, 6th Ed, Elsevier (2005). 2- S. Hassani "Mathematical Methods for Students of Physics and Related Fields 2nd Ed, Springer (2009).
Main references (sources)	1- K.Weltner, W..I. Weber, J.G. Peter Schuster "Mathematics For Physicists And Engineers" Springer (2009). 2- M.T. Vaughn "Introduction To Mathematical Physics" Wiley (2007). V. B.R. Kusse And E.A. Westwig "Mathematical Physics" Wiley (2006).
Recommended books and references (scientific journals, reports…)	R.Wrede, M.R. Spiegel "Thgory And Problems Of Advance Calculus', Schaum's Outline Series 2nd Ed, Mograw-Hill (2002).
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:

Material physics (1)

2. Course Code:	
PM 307	
3. Semester / Year:	
First semester / 2024-2025	
4. Description Preparation Date:	
1-10-2024	
5. Available Attendance Forms:	
Weekly	
6. Number of Credit Hours (Total) / Number of Units (Total):	
2 Theoretical – 2 Practical – 3 Units	
7. Course administrator's name (mention all, if more than one name)	
Prof. Dr. Inaam Mohammed Abdul Majeed Assist. Prof. Dr. Ban Mazen Muzahim	
8. Course Objectives	
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation
9. Teaching and Learning Strategies	
Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations,

	mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Structure of atoms	Structure of atoms, Periodic Table, type of bonding,	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		Crystal structures, The Space Lattice and Unit Cells, Crystal Systems and Bravais Lattice,	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Types of Unit Cells	Types of Unit Cells, Principal Metallic Crystal Structures, SC, BCC , Atomic Packing Factor of BCC Structure, FCC,	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours		Atomic Packing Factor of FCC Structure, Hexagonal Close-Packed Structure Crystal lattices	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		Atom Positions in Cubic Unit Cells, plane miller indices, Directions in Cubic Unit Cells,	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		Planes and Directions in Hexagonal Unit Cells, Volume Density, Planar	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		exam		
8	2 hours		-Atomic Density, Linear Atomic Density	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Crystalline Defects	Crystalline Defects, Crystal Defects Classification	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours		Classification of materials, Metals , Ceramics, Polymers, Composites,	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours		Advanced Materials,Nanoengineered Materials	Theoretical	Daily quizzes, monthly tests, and reports

12	2 hours	Mechanical Behavior of Materials	Mechanical Behavior of Materials, Stress, Strain, Elastic moduli, Strength and Stress-Strain Curve	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours		-Ductility, Toughness, Hardness, Creep	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours		Exam 2	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours		-		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Materials Science and Engineering: An Introduction" by William D. Callister Jr.
Main references (sources)	Introduction to Solid State Physics" by Charles Kittel.
Recommended books and references (scientific journals, reports…)	encyclopedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Virtual Lab.
2. Course Code:
PPP 321
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical – 2 Practical – 3 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Qusay Adnan Prof. Dr. Inaam Mohammed Abdulmajeed Dr. Ali Khaled Aboud
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours		تعريفية ومقدمة عن تجارب المختبر	practical	Daily quizzes, monthly tests, and reports
2	2 hours		Photoelectric Effect	practical	Daily quizzes, monthly tests, and reports
3	2 hours		Pendulum Lab	practical	Daily quizzes, monthly tests, and reports
4	2 hours		Buoyancy	practical	Daily quizzes, monthly tests, and reports
5	2 hours		Mass and Spring	practical	Daily quizzes, monthly tests, and reports
6	2 hours		امتحان	practical	Daily quizzes, monthly tests, and reports
7	2 hours		Vector Addition	practical	
8	2 hours		Energy Skate Park -	practical	Daily quizzes, monthly tests, and reports
9	2 hours		Black Body Spectrum	practical	Daily quizzes, monthly tests, and reports

10	2 hours		Wave on a string	practical	Daily quizzes, monthly tests, and reports
11	2 hours		Molecule and Light	practical	Daily quizzes, monthly tests, and reports
12	2 hours			practical	Daily quizzes, monthly tests, and reports
13	2 hours			practical	Daily quizzes, monthly tests, and reports
14	2 hours		practical exam		
15	2 hours		Theoretical exam		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Laboratory notebook
Main references (sources)	Fundamentals of Physics" Halliday and Resnick, Jearl Walker, 9th Ed. 2011 John Willy and sons, inc. 1- "University Physics with Modern Physics" Sears and Zemansky's, Hugh D. Young and Roger A. Freedman, 11th Ed.
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia , PhET Simulations

Course Description Form

1. Course Name:
Physics of Light
2. Course Code:
PES 313-1
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Firas Jawad Kazem
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1	**Review of some basic principles of Molecular Physics- Rotation & vibration of molecules**	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		**molecular spectral region- degeneracy & multiplicity of the molecular energy states- energy level diagram of molecules**	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	=	**Some basic principles of Photophysics; Luminescence, photoluminescence & chemical luminescence, condensed aromatic hydrocarbons**	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter 2	**The photophysics processes; Absorption- quantitative aspects, .hot bands, photoluminescence: Fluorescence- quantitative aspects**	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		**Phosphorescence, Delayed fluorescence,**	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		**Non-radiative processes (Uni-molecular processes), internal conversion, intersystem crossing, Jabionskii diagram**	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	=	**Exam**		
8	2 hours	Chapter 3	**- Lifetime and transition probability, absorption spectrometers, fluorescence spectrometers, excitation fluorescence spectrum**	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	**Chapter 4**	**The kinetics of photo-luminescence; rate parameters, quantum efficiency**	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	=	**Lifetime and quantum efficiency, Steady-state condition & Transient condition**	Theoretical	Daily quizzes, monthly tests, and reports

11	2 hours	Monthly Exam	**lifetime measurements, effect of temperature on lifetime**	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter 5	**Bi-molecular competing processes; collision impurity quenching**	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	**Chapter6**	**energy transfer quenching & concentration quenching** -	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter6	**self-absorption quenching** rate parameters of Bi–molecular competing processes	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	Exam		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	**Photoluminescence of solutions- C. A. Parker.**
Main references (sources)	**Photophysics of aromatic molecules- J.B. Birks.**
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Polymer Application
2. Course Code:
PES 313-2
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Nadia Abbas Ali
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future

	- Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	**Fundamentals of POLYMERS**	Fundamentals of POLYMERS	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	**Physical properties of polymers**	Physical properties of polymers : mechanical (elasticity, yield stress, ductility, , strength, hardness), physical (electrical, optical, magnetic, thermal).	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	**Chemical properties:**	Chemical properties: solubility and erosion, corrosion.	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours		mechanical test (young modules), strength, stress , strain	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		Degree of polymerization and molecular weight	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	**Thermal properties of polymer**	Thermal properties of polymer DSC, TGA,	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		**exam1**		
8	2 hours	**Characteristics of polymer**	-Characteristics of polymer(X-ray diffraction , FTIR) .	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	**Applications of POLYMERS**	Applications of POLYMERS in industrial	Theoretical	Daily quizzes, monthly tests, and reports

10	2 hours		electrical test (resistivity, resistance , conductivity)	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours		Synthetic polymer, Addition , Condensation , Polymerization	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours		optical properties (transmission , absorption)	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours		-polymer blend	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours		contact angle and hydrophobic , hydrophilic materials	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours		-**exam 2**		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	H.Boenig, Fundamentals of Plasma Chemistry and Tehnolog Technomic Publishing Co.Inc. Lancaster Basel, 1990.
Main references (sources)	Practical Surface Analysis, 2- edition, Edited by D.Briggs, M.P.Seah, J.Wiley & Sons Ltd, 1990.
Recommended books and references (scientific journals, reports…)	Biomaterials Science, An Intoduction to Materials in medicin Eds. B. D. Ratner and A. S. Hoffman, Academic Press, New York, 1996.
Electronic References, Websites	• Plasma-surface modification of biomaterials, P.K.Chua, J.Y.Chena, L.P.Wanga, N.Huang, Elsevier Science B.V, 2002. XXX – Articles about *Biomaterials and Biocompatibilit*

Course Description Form

1. Course Name:
Biomaterials and Bio Compatibility
2. Course Code:
PES 313-3
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Sinai Ibrahim Hussein
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future

	- Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter one	Fundamentals of biomaterials science. Concept of biocompatibility. Classes of biomaterials used in medicine, basic properties, medical requirements and clinical significance. Desinfection and sterilization of biomaterials	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Chapter one	Physico-chemical properties of biomaterials: mechanical (elasticity, yield stress, ductility, toughness, strength, fatigue, hardness, wear resistance), tribological (friction, wear, lubricity), morphology and texture, physical (electrical, optical, magnetic, thermal).	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Chapter one	Chemical and biological properties: solubility and erosion, , corrosion , Biological properties and Biological soft tissue materials	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter two	Elements in contact with the surface of a biomaterial: blood composition, plasma proteins, cells, tissues	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Chapter two	Phenomena at the biointerfaces. Molecular and cellular processes with living environment, blood-materials interaction, short and long term reactions to the body	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Chapter two	Testing of biomaterials: *in vitro*, *in vivo* preclinical and	Theoretical	Daily quizzes,

			in vivo clinical tests. And Technologies of biomaterials processing, as implants and medical devices; improvement of materials biocompatibility by plasma processing.		monthly tests, and reports
7	2 hours		**exam1**		
8	2 hours	Chapter three	-Metal -Based biomaterials, Polymer -based biomaterials , Ceramic -based biomaterials	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Chapter three	Applications of biomaterials , Applications in dentistry , Applications in oral and maxillofacial surgery, Applications in tissue engineering	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	Chapter three	Composites biomaterials , Reinforced of matrix , Based on the type of matrix material , Types of fibers , Fabrication Processes of Fibrous bioComposites, Factors influencing the performance of bio composites	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Chapter four	Synthetic biomaterials , Addition , Condensation , Polymerization	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter four	Characteristics of biomaterials , toxicology, biocompatible , biodegradation, Classification and medical application of biomaterials	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Chapter four	-Biomaterials and Sol–Gel Process: A Methodology for the Preparation of Functional Materials	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter four	Antibacterial Performance of Graded Nano–Composite Biomaterials	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours		-**exam 2**		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	H.Boenig, Fundamentals of Plasma Chemistry and Tehnolog Technomic Publishing Co.Inc. Lancaster Basel, 1990.
Main references (sources)	Practical Surface Analysis, 2- edition, Edited by D.Briggs, M.P.Seah, J.Wiley & Sons Ltd, 1990.
Recommended books and references (scientific journals, reports…)	Biomaterials Science, An Intoduction to Materials in medicin Eds. B. D. Ratner and A. S. Hoffman, Academic Press, New York, 1996.
Electronic References, Websites	• Plasma-surface modification of biomaterials, P.K.Chua, J.Y.Chena, L.P.Wanga, N.Huang, Elsevier Science B.V, 2002. XXX – Articles about *Biomaterials and Biocompatibilit*

Third Stage
Second Semester

Course Description Form

13.	Course Name:
	Quantum Mechanics II
14.	Course Code:
	PQM 304
15.	Semester / Year:
	Second Semester / 2024-2025
16.	Description Preparation Date:
	1-10-2024
17.	Available Attendance Forms:
	Weekly
18.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
19.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Wasan Zuhair Rashid Prof. Dr Ahmed Najm	
20.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

21. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter one	The Equation of Motion	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Chapter one	- The equation of Motion and Poisson Brackets	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Chapter one	- Solutions of some one-dimensional systems	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter two	- Step potential	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Chapter two	exam	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Chapter two	The finite potential barrier	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	Chapter two	Square well potential		
8	2 hours		-Exam 1	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Chapter three	Infinite square well potential	Theoretical	Daily quizzes, monthly tests, and reports

10	2 hours	Chapter three	The Harmonic oscillator: Polynomial solution	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Chapter three	Quantum Mechanics in three Dimensions	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours		exam	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Chapter four	- Schrodinger equation in three coordinates	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter four	Momentum and spin interaction	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Chapter four	-The Hydrogen atom		
16					

23. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1- Introduction to Quantum Mechanics, D. J. Grifiths , second Edition. 2- Modern Physics and Quantum Mechanics, E. E. Anderson
Main references (sources)	Introduction to quantum mechanics, Dick and Wittike Introduction to quantum mechanics, D. Park
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	https://ocw.mit.edu

Course Description Form

13. Course Name:

Laser Physics (2)	
14. Course Code:	
PLP 306	
15. Semester / Year:	
Second Semester / 2024-2025	
16. Description Preparation Date:	
1-10-2024	
17. Available Attendance Forms:	
Weekly	
18. Number of Credit Hours (Total) / Number of Units (Total):	
2 Theoretical - 2 Practical - 3 Units	
19. Course administrator's name (mention all, if more than one name)	
Asst. Prof. Dr. Iman Karim Hassan Assist. Prof. Dr. Sarmed Saleh	
20. Course Objectives	
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation
21. Teaching and Learning Strategies	

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Introduction	Introduction to basics of laser physics; What is a Laser and Maser?; Working principle of a Laser; Main components of a Laser; Lasers based on number of energy levels; Lasers modes; Main properties of a Laser; Types of Laser; Several ways to classify lasers; Mode of operation; Continuous Wave (CW) or Pulsed	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Continue the Several ways to classify lasers;	Continue the Several ways to classify lasers; Active medium: - Solid lasers: Crystal (Ruby Laser; Nd-YAG laser), Glass (Nd-Glass laser); Gas lasers: Atomic (He-Ne Laser), Ionic (Argon Ion Laser), Molecular (CO2 Laser); Liquid lasers (Dye Laser); Chemical Laser (HCl Laser and HF Laser); Semiconductor lasers (GaAs Injection Laser) ; Color Center Laser; Free Electron Lasers; The basis of laser levels; Classification may be done on basis of other parameters; Gain of the laser medium; Power delivered by laser Efficiency or Applications	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Solid State Laser	Solid State Laser; The Ruby Laser; Construction of ruby laser (laser medium, the pump source, and the optical resonator); Working of Ruby	Theoretical	Daily quizzes, monthly tests, and reports

			laser; Energy level scheme of Ruby laser; Applications		
4	2 hours	Solid State Laser	Nd-YAG LASER; Why YAG?; Active medium; Pumping Mechanism: optical pumping; Reflective mirror set up; Elliptical Cavity; Working of Nd-YAG laser; Energy level scheme of Nd-YAG laser; Applications	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Gas Laser	Gas laser; the Types of gas laser; Atomic gas laser: Helium-Neon and Copper Vapor; Ionic gas laser: Argon ion gas or Helium Cadmium gas; Molecular gas laser: Carbon Dioxide (CO_2), Nitrogen (N_2); He-Ne Laser: Construction of	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Atomic Gas Laser	Continue the He-Ne laser; Laser process in a He-Ne laser; Energy level scheme of He-Ne laser; The role of the Helium gas in He-Ne laser; Absorption and Amplification in He Ne Laser; Application of the He-Ne Laser	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	Introduction; the Several ways to classify lasers; Solid State Laser; Gas Laser	**First Exam**		
8	2 hours	Molecular Gas Laser	CO_2 Laser; the active medium;; the electric discharge pumping process; Mirror resonators (Internal mirror, External mirror); the molecules have wide energy band (electronic, vibrational, and rotational energy levels); The type of molecules (Non-linear molecules; Linear -molecules)	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Molecular Gas Laser	The modes of CO_2 molecule: Symmetric stretching mode [i00];	Theoretical	Daily quizzes, monthly tests,

			Asymmetric stretchingmode [00k]; Two bending modes [0j0]; what are mean by the energy level [001], [100] and [020]; Energy level scheme of CO2 laser; CO2 molecule can pumped by two process: (Electron collision; Resonant energy transfer from (N2) molecule); The beneficial effect of N2 gas and He gas; Types of CO2 lasers; Applications.		and reports
10	2 hours	Liquid Laser	Dye Laser; Active medium; Types of dyes; How can compute the concentration of dye; The Pumping source of dye laser; Optical resonator system; Working; Energy-level diagram typical of dye; Applications; Important definitions; non-radiative transition (Internal Conversion; Intersystem Crossing); radiative transition (Fluorescence; Phosphorescence)	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours		Second Exam	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Leaser in medicine	Introduction; Surgery; Dermatology and Cosmetic Procedures; Ophthalmology; Dentistry; Cancer Treatment; Endoscopy; Hair Removal; what is the different between PDT and laser ablation?; Light causes biological damage; Photo medicine; Photobiology; Laser Induced Biological Damage	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Leaser in medicine	Tissue Interactions and Biological Effects (Absorption, Reflection,	Theoretical	Daily quizzes, monthly tests, and reports

			Transmission, Scattering); Biological Effects; Interaction mechanisms between -the laser radiation andbiological tissue; The four major chromophores in skin; Laser skin interactions (Epidermis, Dermis, Subcutaneous tissue, Some common laser skin interactions (Absorption, Photo thermal effects, Photochemical effects, Ablation, Collagen remodeling); Some types of lasers that's used in skin treatments; Recommendations before and after treatment; Laser in Dermatology		
14	2 hours	Leaser in medicine	The Eye and Electromagnetic Radiation; The components of the eye (Cornea, Iris, Pupil, Lens, Retina, Optic Nerve, Vitreous Humor, Sclera, Choroid); Laser induced eye damage; The refraction errors in human eyes; The refraction errors treatment with laser (LASIK eye surgery); What condition dose LASIK treat?; Does LASIK permanently fix eyesight?; What happens during LASIK surgery?	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Leaser in medicine	-Third Exam		
16					

23. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Principles of Lasers ,O.Svelto, 2nd Edition , Plenum Press . New York and London , 1998.
Main references (sources)	1- Laser and their applications, M .J. Beesley, Taylor & Francis LTD, 1976. 2- Introduction to optical electronics, Amnon Yariv, Holt Richard Winston, 1976.
Recommended books and references (scientific journals, reports…)	Principles of Lasers ,O.Svelto, 2nd Edition , Plenum Press . New York and London , 1998.
Electronic References, Websites	Principles of Lasers ,O.Svelto, 5th Edition , (Springer)

Course Description Form

13.	Course Name:
	Physical Optics
14.	Course Code:
	PO 302
15.	Semester / Year:
	Second Semester / 2024-2025
16.	Description Preparation Date:
	1-10-2024
17.	Available Attendance Forms:
	Weekly
18.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Practical - 3 Units
19.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Hamad Rahim Hamoud Assist. Prof. Dr. Omar Adnan Ibrahim	
20.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

21. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Michelson interferometer	Michelson interferometer	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Michelson interferometer	Circular and localized fringes	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Michelson interferometer t	Applications of Michelson's interferometer	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Interference involving multiple reflections	Measurement of wavelength	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Interference involving multiple reflections	Measurement of wavelength difference	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Interference involving multiple reflections	Measurement of refractive indices or thickness for plate	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	Ch. 1 and Ch. 2	Measurement of length		
8	2 hours	Diffraction phenomena	-Testing of the perfection of surfaces	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Diffraction phenomena	Spectral resolution of finite wave train Coherence and linewidth	Theoretical	Daily quizzes, monthly tests, and reports

10	2 hours	Diffraction phenomena	Introduction	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Diffraction phenomena	Reflection from parallel films	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Polarization of light	Airy function	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Polarization of light	- Fabry – Perot interferometer	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Polarization of light Orthogonal polarization Polarization angle and Brewster law	Chromatic resolving power of Fabry – Perot instruments	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	exam	-		
16					

23. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Halliday, Resnick and Walker; Fundamentals of Physics; 8th edition 2008. • F. Sears, Addison-Wesley publishing company, Optics 1964. • F. Jenkins& H. White, Fundamentals of Opt by, McGraw Hill book company, 4th edition, 1985
Main references (sources)	1. Hecht Zajac, Optics, 1974. Grant R. Fowles, Introduction to modern optics, 2nd ed. 1975.
Recommended books and references (scientific journals, reports…)	Miles V. Klein and Thomas E. Furtak, Optics, 2nd e 1986.
Electronic References, Websites	Justin Peatross and Michael Ware, Physics of li and optics, 2015

Course Description Form

13.	Course Name:
	Optical Lab.
14.	Course Code:
	PPP 322
15.	Semester / Year:
	Second Semester / 2024-2025
16.	Description Preparation Date:
	1-10-2024
17.	Available Attendance Forms:
	Weekly
18.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Practical - 3 Units
19.	Course administrator's name (mention all, if more than one name)
Name: Assist. Prof. Dr. Salma Mohammed Hasan	
20.	Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

21. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours		ↄ A brief overview of laboratory experiments	Practical	Daily quizzes, monthly tests, and reports
2	2 hours		Diffraction at a slit and Heisenberg's Uncertainty Principle	Practical	Daily quizzes, monthly tests, and reports
3	2 hours		Determination of the refractive index of a transparent glass plate employing Michelson's Interferometer	Practical	Daily quizzes, monthly tests, and reports
4	2 hours		Interference by multiple beam reflections: Newton's Rings	Practical	Daily quizzes, monthly tests, and reports
5	2 hours		Fresnel's diffraction via the zone plate	Practical	Daily quizzes, monthly tests, and reports
6	2 hours		Determination of the width of a paper employing wedge interference phenomenon	Practical	Daily quizzes, monthly tests, and reports
7	2 hours		Determination of the Special Rotation of an Optically Active Solution via the Half-Shade Penumbra Polarimeter	Practical	
8	2 hours		-Diffraction Grating	Practical	Daily quizzes, monthly tests, and reports
9	2 hours		Photo-voltaic Cell	Practical	Daily quizzes, monthly tests, and reports

10	2 hours		Light Polarization by Reflection at a Dielectric – Fresnel's Equations	Practical	Daily quizzes, monthly tests, and reports
11	2 hours		Review experiments	Practical	Daily quizzes, monthly tests, and reports
12	2 hours		**Exam**	Practical	
13	2 hours		-	Practical	
14	2 hours			Practical	
15	2 hours		-		
16					

23. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	ملزمة المختبر
Main references (sources)	1-F. Sears, Addison-Wesley publishing company, Optics 1964 . 2-F. Jenkins& H. White, Fundamentals of Optics by, McGraw Hill book company, 4th edition, 1985
Recommended books and references (scientific journals, reports…)	. Halliday, Resnick and Walker; Fundamentals of Physics; 8th edition 2008. 2-F. Sears, Addison-Wesley publishing company, Optics 1964 . 3-F. Jenkins& H. White, Fundamentals of Opti by, McGraw Hill book company, 4th editi 1985
Electronic References, Websites	Wikipedia

Course Description Form

13.	Course Name:
	Material Physics II
14.	Course Code:
	PM 309
15.	Semester / Year:
	Second Semester / 2024-2025
16.	Description Preparation Date:
	1-10-2024
17.	Available Attendance Forms:
	Weekly
18.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Practical - 3 Units
19.	Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Inaam Mohammed Abdulmajeed Asst. Prof. Dr. Ban Mazen Muzahim	
20.	Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

21. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	**Thermal Properties**	Thermal Properties, Heat Capacity, Thermal expansion coefficient of thermal expansion, Applications of thermal expansion	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		Thermal conductivity, Mechanisms of Thermal conductivity, Thermal stresses, Thermal shock	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	**Electrical Properties**	Electrical Properties, classified of materials based on their electrical conductivity, Electronic and Ionic Conduction	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours		Energy Band Structures in Solids, Fermi Energy and Energy Bands in Solids, Conduction in terms of band and atomic bonding models	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		Energy Band Structures and Conductivity (metals), Relation to atomic bonding Electron Mobility, Conductivity / Resistivity of Metals	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Optical Properties	Optical Properties, Electromagnetic Radiation Light Interactions with Solids, Atomic and Electronic Interactions	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		**exam**		
8	2 hours	Optical Properties of Metals	-Optical Properties of Metals, Typical band structures, Refraction, Reflection	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours		Absorption, Absorption mechanisms, Transmission, Colors, Optical applications	Theoretical	Daily quizzes, monthly tests, and reports

10	2 hours	Solid Solutions	Solid Solutions, types of Solid Solutions, RULES FOR FORMATION OF SOLID SOLUTION, HUME-ROTHARY RULES	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours		Interstitial Solid Solution, Intermediate Phases, DEFINITION OF PHASE	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Phase Diagrams	Phase Diagram for Pure Substance, Critical point, The triple point, Types of phase diagrams	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours		-Lever rule, Binary phase diagram, Eutectic systems,	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours		**Exam 2**	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours		-Cooling curve for pure iron, IRON-CARBON (Fe-C) PHASE DIAGRAM, Definition of structures, Applications		
16					

23. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Materials Science and Engineering: An Introduction" by William D. Callister Jr. Introduction to Solid State Physics" by Charles Kittel
Main references (sources)	Materials science for engineers
Recommended books and references (scientific journals, reports…)	Solid state physics and semiconductors
Electronic References, Websites	Wikipedia

Course Description Form

13.	Course Name:
	Vertical Lab
14.	Course Code:
	PPP 322
15.	Semester / Year:
	Second Semester / 2024-2025
16.	Description Preparation Date:
	1-10-2024
17.	Available Attendance Forms:
	Weekly
18.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Practical - 3 Units
19.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Qusay Adnan Prof. Dr. Inaam Mohammed Abdul Majeed Dr. Ali Khaled Abood	
20.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

21. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**Experiment 1**	Experiment 1	Gases Law	Practical	Daily quizzes, monthly tests, and reports
2	2 hours	Experiment 2	Momentum and Collision	Practical	Daily quizzes, monthly tests, and reports
3	2 hours	Experiment 3	Project Motion	Practical	Daily quizzes, monthly tests, and reports
4	2 hours	Experiment 4	Capacitor Lab	Practical	Daily quizzes, monthly tests, and reports
5	2 hours		exam	Practical	Daily quizzes, monthly tests, and reports
6	2 hours	Experiment 5	Geometric optics1	Practical	Daily quizzes, monthly tests, and reports
7	2 hours	Experiment 6	Geometric Optics2	Practical	
8	2 hours	Experiment 7	Wave interference -	Practical	Daily quizzes, monthly tests, and reports
9	2 hours	Experiment 8	Wave on a string	Practical	Daily quizzes, monthly tests, and reports

10	2 hours		Review experiment	Practical	Daily quizzes, monthly tests, and reports
11	2 hours			Practical	Daily quizzes, monthly tests, and reports
12	2 hours		exam	Practical	Daily quizzes, monthly tests, and reports
13	2 hours			Practical	Daily quizzes, monthly tests, and reports
14	2 hours			Practical	Daily quizzes, monthly tests, and reports
15	2 hours		-		
16					

23. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Laboratory book
Main references (sources)	"Fundamentals of Physics" Halliday and Resnick, Jearl Walker, 9th Ed. 2011 John Willy and sons, inc. "University Physics with Modern Physics" Sears and Zemansky's, Hugh D. Young and Roger A. Freedman, 11th Ed.
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Mathematics (5)
2. Course Code:
PMa 310
3. Semester / Year:
Second Semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Ahmed Abbas Hassan Assist. Prof. Dr. Arkan Rif'ah Reda
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1	Green's theorem in the plane Problems of Gauss Problems Stoke's theorem	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		Solved problems	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	=	Divergence theorem	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter 2	Solved problems	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		Stoke's theorem	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		Solved problems	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	=	Complex numbers 2.1 Geometrical representation of imaginary numbers 2.2 Argand diagram 2.3 Modulus and argument 2.4 H.W.		
8	2 hours	Chapter 3	-Solved problems	Theoretical	Daily quizzes, monthly tests,

					and reports
9	2 hours	**Chapter 4**	Exponential and circular functions of complex variables 3.1 Demoivre's theorem 3.2 Problems 3.3 Roots of a complex number	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	=	Green's theorem in the plane Problems of Gauss Problems Stoke's theorem	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Monthly Exam	Solved problems	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter 5	Divergence theorem	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	**Chapter6**	-Solved problems	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter6	Stoke's theorem	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	-Solved problems		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	• Weir, Hass and Giordano, Thomas, "Calculus", 11th edition, Media Upgrade, Pearson International edition (2008). • H. S. Weber and G. B. Arfken, "Essential Mathematics Methods for Physicists", 6th edition, Elsevier (2005).
Main references (sources)	C. Ray Wylie, "Advanced Engineering Mathematics", 4th edition (International Students Edition), Mcgraw-Hill (1975).
Recommended books and references (scientific journals, reports…)	Sokolnikoff and Redheffer, "Mathematics of Physics and ,"Modern Engineering Mcgraw-Hill (1958).

Electronic References, Websites	• Weir, Hass and Giordano, Thomas, "Calculus", 11th edition, Media Upgrade, Pearson International edition (2008). • H. S. Weber and G. B. Arfken, "Essential Mathematics Methods for Physicists", 6th edition, Elsevier (2005).

Course Description Form

1. Course Name:	
Molecular Physics	
2. Course Code:	
PMoP 312	
3. Semester / Year:	
Second Semester / 2024-2025	
4. Description Preparation Date:	
1-10-2024	
5. Available Attendance Forms:	
Weekly	
6. Number of Credit Hours (Total) / Number of Units (Total):	
2 Theoretical - 2 Units	
7. Course administrator's name (mention all, if more than one name)	
Prof. Dr. Firas Jawad Kazem Prof. Dr. Zainab Sabeeh	
8. Course Objectives	
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Review of atomic physics	Introduction to atomic physics, Electromagnetic Radiation, Electromagnetic Spectrum	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Atomic models	Atomic structure, Emission and Absorption Spectroscopy, Types of Spectra	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Quantum description	Classical wave equation, Schrodinger equation, The Variational Energy, Atomic Orbitals	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chemical bonding	Chemical Bond, Types of Chemical Bonds,(Ionic Bond,Covalent Bonds,Hydrogen Bonds,van der Waals)	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Bond polarity	Electronegativity, Bond Polarity and Electronegativity, *Polarity of Molecules*	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		امتحان شهري (1)	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	Molecular dipole moment	Electron affinity ,Bond Dipole Moments, Molecular Dipole Moments, Lewis Electron-Dot Symbols		
8	2 hours	Molecular structure	-Determining Molecular Shape, Sigma (s) and Pi (p) Bonds	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Molecular spectroscopy	Molecular spectroscopy Spectroscopy, Diatomic	Theoretical	Daily quizzes,

			molecules: Structure & electronic states,		monthly tests, and reports
10	2 hours	Molecular spectroscopy	, Diatomic molecules: vibrations& Vibrational energy levels	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Molecular spectroscopy	Rotational and Vibrational Transition Quantized rotational energy levels	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Molecular spectroscopy	Rotational Spectra Vibrational States. Rotational and Vibrational Transition	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Molecular spectroscopy	Jablonskii diagram Photophysical processes -Spectrophotometers setup	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours		review	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	-		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	م "Physics of atoms and molecules, B.H. Bransden and C.J.Joachain
Main references (sources)	"Molecular spectroscopy", Jack D.Graybeal "Atomic Physics", Max Born
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:

Medicine Physics

2. Course Code:

PES 3141	
3. Semester / Year:	
Second Semester / 2024-2025	
4. Description Preparation Date:	
1-10-2024	
5. Available Attendance Forms:	
Weekly	
6. Number of Credit Hours (Total) / Number of Units (Total):	
2 Theoretical - 2 Units	
7. Course administrator's name (mention all, if more than one name)	
Prof. Dr. Samar Issa Imran	
8. Course Objectives	
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation
9. Teaching and Learning Strategies	
Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics.

	- Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter one	Ultrasound in Medicine	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		Physical Principles of Ultrasound	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Chapter two	Ultrasound Therapy	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours		Basic atom	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		decay processes	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		Radioactivity	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		exam		
8	2 hours		-Interaction of Radiation with Matter	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours		Production of X – rays	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours		Nuclear Radiation detectors	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours		Gamma Camera Components	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours		Positron Emission Tomographic Imaging (PET)	Theoretical	Daily quizzes, monthly tests, and reports

13	2 hours		-Radiation units	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours		Radiation Doses and Risks to Patients	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours		-exam		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1. Alan Martin, Sam Harbison, Karen Beach Peter Cole An Introduction to Radiation Protection, 7th edition , Taylor Francis Group, LLC,2019.
Main references (sources)	Hooshang Nikjoo, Shuzo Uehara. Interaction of Radiation with matter. Taylor & Francis Group, LLC,2012.
Recommended books and references (scientific journals, reports…)	P P Dendy, B Heaton .Physics for Diagnostic Radiology. Tayl & Francis Group, LLC,2012
Electronic References, Websites	Wikipedia

Fourth Stage
First Semester

Course Description Form

25.	Course Name:
Quantum Mechanic III	
26.	Course Code:
PQM 407	
27.	Semester / Year:
First semester / 2024-2025	
28.	Description Preparation Date:
1-10-2024	
29.	Available Attendance Forms:
Weekly	
30.	Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Units	
31.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Ali Abdul Latif Assistant Prof. Dr. Firas Zuhair Majeed	
32.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

33. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1	Occupation numbers representation for Harmonic oscillators:	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		The raising and lowering operators .	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	=	Eigen values and eigen states.	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter 2	Action of raising and lowering operators.	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		Wave functions in coordinate representation (generating the Hermite polynomials)	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		Classical limit of motion	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	=	Angular momentum operators (Ladder operators)		
8	2 hours	Chapter 3	-Eigen values of the angular momentum operators.	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	**Chapter 4**	Normalization of the eigen values of the angular momentum operators.	Theoretical	Daily quizzes, monthly tests, and reports

10	2 hours	=	Exam	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Monthly Exam	Angular momentum matrices.	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter 5	Spin angular momentum operators	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	**Chapter6**	-Matrix representation of spin operators	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter6	Spin matrices Probability of spin up and down	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	-		
16					

35. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

36. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Quantum Mechanics, D. J. Grifiths , 2nd Edition.
Main references (sources)	Introduction to quantum mechanics, Dick and Wittike Introduction to quantum mechanics, D. Park
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	University of Cambridge https://www.damtp.cam.ac.uk/user/tong/em.html

Course Description Form

25.	Course Name:
	Nuclear Physics I
26.	Course Code:
	PNP 401
27.	Semester / Year:
	First semester / 2024-2025
28.	Description Preparation Date:
	1-10-2024
29.	Available Attendance Forms:
	Weekly
30.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
31.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Asia Hamid Hamad Prof. Dr. Ghaith Nemah Falih	
32.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

33. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1 Historical review (Development of atom)	Dalton's atom, Electron, Thomson's atom, Proton, Neutron, Penetration of alpha particle through thin gold foil	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	=	Rutherford's atom, Failure of Thomson's atom, Failure of Rutherford's atom, Bohr's atom, Photon energy, What is Bohr's idea account for?	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Chapter 2 Properties of nuclei (Basic nuclear concepts)	Nuclear radii, Nuclear density, Nuclear size,	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	=	Nomenclature (Nuclide, Isotopes, Isobars, Isomer, Nucleon, Mesons), Mass defect, Binding energy,	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	=	Nuclear forces, Properties of nuclear forces, Nuclear separation energy, Chart of Nuclides and nuclear stability, Nuclear abundance	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Chapter 3 Properties of nuclear states	Nuclear angular momentum, Nuclear Parity, Magnetic dipole moments,	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	=	Electric quadrupole moments, Wave mechanical properties, Types of statistics: (Bose-Einstein statistics and Fermi – Dirac statistics)		
8	2 hours	Monthly Exam	-Monthly Exam in Chapters 1, 2 and 3	Theoretical	Daily quizzes,

					monthly tests, and reports
9	2 hours	Chapter 4 Quantum mechanical description of Nuclei	Schrodinger wave equation, Bound states in one dimensional systems, Particle in square well	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	=	Bound states in three dimensions, Neutron-Proton system: Bound state of the deuteron, overview of cross section calculation.	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Chapter 5 Interaction of Radiation with Matter	Charged particle interaction: (Maximum Energy Transfer in a Single Collision, Stopping Power, Range of a particle)	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	=	Interaction of electrons with matter, Interaction of neutrons with matter (Elastic scattering, Inelastic scattering)	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	=	-Interaction of gamma radiation with matter (Photoelectric effect, Compton scattering, pair production)	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	=	Attenuation of gamma rays Applications and solved problems	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Monthly Exam	-Monthly Exam in chapters 4 and 5		
16					

35. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

36. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introductory: Nuclear Physics
Main references (sources)	References: 1. Nuclear Physics Concept, By Walter E. Meyerhof.
Recommended books and references (scientific journals, reports…)	Introductory: Nuclear Physics, By Krane.
Electronic References, Websites	Lecture Notes of Massachusetts Institute Technology.

Course Description Form

25.	Course Name:
	Solid State Physics I
26.	Course Code:
	PSS 403
27.	Semester / Year:
	First Semester / 2024-2025
28.	Description Preparation Date:
	1-10-2024
29.	Available Attendance Forms:
	Weekly
30.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
31.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Farah Tariq Muhammad Nouri Prof. Dr. Iftikhar Mahmoud	
32.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

33. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	1-Crystal structure	Basis, Lattice crystal translation vector and lattice- symmetry operations- two dimensional lattice type- three dimensional lattice type- Miller indices, the indices of a direction	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	1-Crystal structure	Position in the cell -simple crystal structure (Sodium chloride structure, Cesium chloride structure- Close-packed structure- Diamond structure, Zinc Sulfide structure).	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	2- Crystal diffraction and the reciprocal lattice:	Bragg law- Experimental diffraction methods- Laue method- rotating crystal method	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	2- Crystal diffraction and the reciprocal lattice:	powder method- reciprocal lattice- Brilloun zones- structure factor of the basis	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	3-Crystal Binding:	crystal of Inert gases- Vander Waals- London interaction- equilibrium lattice constants- Cohesive energy- Repulsive interaction-	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	3-Crystal Binding	Compressibility and Bulk modulus- Ionic crystal- Madelung energy - Covalent	Theoretical	Daily quizzes, monthly tests, and reports

			crystal- Metal crystal- Hydrogen-bonded crystal- Atomic radii		
7	2 hours	4- Phonons and Lattice vibrations:	phonon Momentum- Inelastic scattering of photons by long wavelength phonons- Inelastic scattering of neutrons by phonons-advantage		
8	2 hours	4- Phonons and Lattice vibrations:	- Vibration of monoatomic lattices- group velocity- phase velocity- Vibrational modes of Lattice with two atoms per primitive cell- Local phonon modes.	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	5-Thermal propertiesof solids:	Lattice heat capacity- Classical model for specific heat- Einstein model- Density of modes in one dimension- Density of modes in three dimensions-	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	5-Thermal propertiesof solids	Debye model of the lattice heat capacity, An harmonic crystal interactions- thermal expansion- thermal conductivity- Lattice thermal resistivity- Normal and Umklapp processes.	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	6- Free electron model :	classical free electron theory- Drude model- Lorentz model	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	6- Free electron model :	Thermal conductivity for free electron gas.	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	7-Quantum free electron model:	- energy levels and density of state in one dimension- free electron gas in three dimensions	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	7-Quantum free electron model:	density of state for free electron gas in three dimensions-	Theoretical	Daily quizzes, monthly tests, and reports

15	2 hours	7-Quantum free electron model:	Sommerfeld's model for metallic conduction- electrical conductivity. -		
16					

35. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

36. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

25.	Course Name:
Electromagnetic Theory I	
26.	Course Code:
PET 405	
27.	Semester / Year:
First semester / 2024-2025	
28.	Description Preparation Date:
1-10-2024	
29.	Available Attendance Forms:
Weekly	
30.	Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Units	
31.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Kazim Abdul Wahid Adem Prof. Dr. Thamer Hamid Khalaf	
32.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future

	- Achieving quality and academic accreditation

33. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Review of Basic Relevant Mathematics:	Vector Algebra, Gradients Theorem, Divergences Theorem, Curls Theorem: (Stokes' theorem), Curvilinear Coordinates, Spherical Coordinates, Cylindrical Coordinates, and the Dirac Delta Function.	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Static Electric and Magnetic Fields in Vacuum.	Static Charges, The electrostatic Force, The Electric Field, Gauss' Law, and The Electric Potential.	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Static Electric and Magnetic Fields in Vacuum:	Moving Charges, The Continuity Equation, Magnetic Forces, The Law of Biot and Savart, Amp`ere's Law, The Magnetic Vector Potential, and The Magnetic Scalar Potential.	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Charge and Current Distributions.	Multipole Moments, The Cartesian Multipole Expansion, The Spherical Polar Multipole expansion, Interactions with the Field, Electric Dipoles, Magnetic Dipoles, and Potential Energy.	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Slowly Varying Fields in Vacuum:	Magnetic Induction, Electromotive Force, Magnetically Induced Motional EMF, Time-Dependent Magnetic Fields, and Faraday's Law.	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Slowly Varying Fields in Vacuum:	Displacement Current, Maxwell's Equations, The Potentials, The Lorentz Force	Theoretical	Daily quizzes, monthly tests,

			and Canonical Momentum, Wave Equation in Vacuum, and Plane Waves.		and reports
7	2 hours	Discussion.	Discussion for the previous subjects.		
8	2 hours	Examination.	-Examination in the previous subjects.	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Energy and Momentum.	Energy of a Charge Distribution, Stationary Charges, Coefficients of Potential, Forces on Charge Distributions, and Potential Energy of Currents.	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	Energy and Momentum.	Poynting's theorem, Magnetic Monopoles, and Duality Transformations	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Static Potentials in Vacuum – Laplace's Equation.	Laplace's equation, Uniqueness Theorem, and $\nabla^2 V = 0$ in One Dimension.	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Static Potentials in Vacuum – Laplace's Equation.	$\nabla^2 V=0$ in Two Dimensions: Cartesian Coordinates in Two Dimensions, Plane Polar Coordinates, and Spherical Polar Coordinates with Axial Symmetry.	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Static Potentials in Vacuum – Laplace's Equation.	$\nabla^2 V=0$ in Three dimensions: Cylindrical Polar Coordinates, and Spherical Polar Coordinates. -	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Discussion.	Discussion for the previous subjects.	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Examination.	-Examination in the previous subjects.		
16					

35. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

36. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Classical Electromagnetic Theory, *by* Jack Vanderlinde, 2005 Springer Science.

Main references (sources)	1- Classical Electromagnetic Theory, *by* Jack Vanderlinde, 2005 Springer Science. 2- Introduction to Electrodynamics, by David Griffiths, prentice-Hall, 1999.
Recommended books and references (scientific journals, reports…)	Introduction to Electrodynamics (Instructor's Solutions Manual), by David Griffiths, 2004.
Electronic References, Websites	• http://www.clerkmaxwellfoundation.org/html/electromagnetic_theory.html https://www.sciencedirect.com/topics/computer-science/electromagnetic-theory

Course Description Form

25.	Course Name:
	Mathematical Physics
26.	Course Code:
	PMaP 409
27.	Semester / Year:
	First semester / 2024-2025
28.	Description Preparation Date:
	1-10-2024
29.	Available Attendance Forms:
	Weekly
30.	Number of Credit Hours (Total) / Number of Units (Total):
	3 Theoretical – 3 Units
31.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Essam Mohammed Ibrahim Prof. Dr. Ahmed Abbas Hassan	
32.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

33. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Special Coordinate Systems	1- Rectangular Cartesian Coordinates 2- Circular Cylinder Coordinates 3- Spherical Polar Coordinates	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Determinants	The order of a determinant 1- Second Order Determinant 2- Third Order Determinant Sign chart Determinant Expansion by Minors Matrix of Minors.	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Determinants	Determinant Expansion by Sarrus Rule The properties of determinants Example Problems on Properties of Determinants Solving a System of Three Equations in Three Variables	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Matrices	Order of matrix The Transpose of a Matrix Types of a Matrix 1- Row Matrix 2- Column Matrix 3- Square matrix 4- Diagonal Matrix 5- Scalar Matrix 6- Unit or Identity Matrix 7- Upper triangular matrix 8- Lower triangular matrix 9- Symmetric matrix 10- A skew-symmetric matrix	Theoretical	Daily quizzes, monthly tests, and reports

			11- Orthogonal matrix		
5	2 hours	Matrices	Operations on matrices 1- Addition of matrices 2- Subtraction of matrices 3- Scalar Multiplication 4- The product of two matrices Properties of Matrix Multiplication	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Matrices	Inverse of a Matrix 1- The inverse of a 2 × 2 matrix 2- The inverse of a 3 × 3 matrix The Gaussian Elimination Method	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	Ch. 1 and Ch. 2	Ch. 1 and Ch. 2		
8	2 hours	The gamma function	The properties of the gamma function The gamma function of the negative numbers The Gamma function for half-integer arguments 1- Gamma function for positive half integer: 2- Gamma function for negative half integer: -Examples	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	The beta function	The properties of the beta function Some important formulas for the beta function Beta function in terms of gamma function Examples	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	Bessel's Function	The properties of Bessel function Theorems of Bessel function Examples	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Bessel's Function	The generating function for Bessel functions Integration form of Bessel's Function	Theoretical	Daily quizzes, monthly tests, and reports

			Examples		
12	2 hours	Legendre functions	The Rodrigues' formula The generating function The properties of Legendre function Theorems of Legendre function Orthogonality of the Legendre polynomials Normalization of the Legendre polynomials Examples	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Hermite functions	The Rodrigues' formula The generating function The properties of Hermite function Theorems of the Hermite function Orthogonal property of the Hermite polynomials Normalization property of the Hermite polynomials -Examples	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Laguerre functions	Rodrigues' formula Generating function Theorems of the Laguerre function Orthogonal property of the Laguerre polynomials Normalization property of the Laguerre polynomials Examples	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Ch. 3, Ch. 4 and Ch. 5	-Ch. 3 and Ch. 4		
16					

35. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

36. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1- H. J. Weber And G. B. Arfken "Essential Mathematical Methods For Physicists,, 6th Ed, Elsevier (2005). 2- S. Hassani "Mathematical Methods for Students of Physics and Related Fields 2nd Ed, Springer (2009).

Main references (sources)	1- K.Weltner, W..I. Weber, J.G. Peter Schuster "Mathematics For Physicists And Engineers" Springer (2009). 2- M.T. Vaughn "Introduction To Mathematical Physics" Wiley (2007). V. B.R. Kusse And E.A. Westwig "Mathematical Physics" Wiley (2006).
Recommended books and references (scientific journals, reports…)	R.Wrede, M.R. Spiegel "Thgory And Problems Of Advance Calculus', Schaum's Outline Series 2nd Ed, Mograw-Hill (2002
Electronic References, Websites	https://libgen.is

Course Description Form

25.	Course Name:
	Nano Technology
26.	Course Code:
	PES 411-1
27.	Semester / Year:
	First semester / 2024-2025
28.	Description Preparation Date:
	1-10-2024
29.	Available Attendance Forms:
	Weekly
30.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
31.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Manal Madhat Abdullah	
32.	Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future

	- Achieving quality and academic accreditation

33. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

34. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1	**Introduction to Nanotechnology**	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		Properties of Nanomaterials Surface area-to-volume ratio Quantum size effects Mechanical, electrical, thermal, and optical properties at the nanoscale	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	=	Synthesis of Nanomaterials – Top-Down Approaches Mechanical milling Lithography (photolithography, electron-beam lithography) Etching and patterning techniques	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter 2	Synthesis of Nanomaterials – Bottom-Up Approaches Chemical vapor deposition (CVD) Sol-gel processing	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		Characterization Techniques Scanning Electron Microscopy (SEM)	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		Transmission Electron Microscopy (TEM)	Theoretical	Daily quizzes, monthly tests, and reports

7	2 hours	=	Atomic Force Microscopy (AFM) **exam1**		
8	2 hours	Chapter 3	Characterization Techniques X-Ray Diffraction (XRD) -	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	**Chapter 4**	UV-Vis and FTIR spectroscopy	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	=	Carbon Nanostructures Fullerenes, carbon nanotubes (CNTs), graphene Properties, synthesis, and applications	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Monthly Exam	Nanomaterials in Electronics and Photonics Nanoscale transistors and memory devices Quantum dots, photonic crystals Nano-optoelectronics	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter 5	Nanotechnology in Medicine and Biology Drug delivery systems Biosensors and diagnostic devices Nanotoxicology and ethical considerations	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	**Chapter6**	Applications -	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter6	Seminar Presentation by students	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	-**exam 2**		

35. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

36. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Nanotechnology • Authors: Charles P. Poole Jr. & Frank J.

	Owens • Publisher: Wiley-Interscience • Year: 2003
Main references (sources)	2. Nanotechnology: Principles and Practices, Author: Sulabha K. Kulkarni, Publisher: Springer, Edition: 3rd Edition, Year: 2014
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:	
(Practical Physics VII) Nuclear Physics	
2. Course Code:	
PPP 421	
3. Semester / Year:	
First semester / 2024-2025	
4. Description Preparation Date:	
1-10-2024	
5. Available Attendance Forms:	
Weekly	
6. Number of Credit Hours (Total) / Number of Units (Total):	
2 Theoretical - 2 Practical - 3 Units	
7. Course administrator's name (mention all, if more than one name)	
Asst. Prof. Dr. Haider Salim Hussein Asst. Dr. Naseer Arif Ahmed	
8. Course Objectives	
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1	Introduction to the laboratory	practical	Daily quizzes, monthly tests, and reports
2	2 hours		radiation protection	practical	Daily quizzes, monthly tests, and reports
3	2 hours	=	Pulse-to-noise ratio calculation	practical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter 2	Experiment No. 1 Kaiker Meter Stability Curve	practical	Daily quizzes, monthly tests, and reports
5	2 hours		Experiment No. 2 Relative stability of the flash detector	practical	Daily quizzes, monthly tests, and reports
6	2 hours		Experiment No. 3 Differential Spectrum and the Window Aperture Effect	practical	Daily quizzes, monthly tests, and reports
7	2 hours	=	Experiment No. 4 Differential Spectrum, Step Effect, and Integral Spectrum	practical	
8	2 hours		Experiment No. 5 Effect of detector voltage on the spectrum	practical	Daily quizzes, monthly tests, and reports
9	2 hours		Experiment No. 6 Effect of Gain on the Spectrum	practical	Daily quizzes, monthly tests, and reports

10	2 hours	=	Experiment No. 7 Counting Statistics	practical	Daily quizzes, monthly tests, and reports
11	2 hours		Experiment No. 8 Least Square Fitting	practical	Daily quizzes, monthly tests, and reports
12	2 hours		Review of experiences	practical	Daily quizzes, monthly tests, and reports
13	2 hours		midterm exam	practical	Daily quizzes, monthly tests, and reports
14	2 hours		midterm exam	practical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	-		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	First semester experiments booklet
Main references (sources)	Experimental Nuclear Physics / Dr. Ali Attia Nuclear Radiation Detection / Dr. Shaza Al-Dark azli
Recommended books and references (scientific journals, reports…)	Books and scientific references available in the college library
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
(Practical Physics VII) Solid state Physics
2. Course Code:
PPP 421
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Practical - 3 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Suad Salman Al-Bassam Prof. Osama Natiq Naji Assist. Prof. Dr. Ban Mazen Muzahim
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours		X-ray diffraction part A	practical	Daily quizzes, monthly tests, and reports
2	2 hours		X-ray diffraction part B	practical	Daily quizzes, monthly tests, and reports
3	2 hours		Forbidden energy gap	practical	Daily quizzes, monthly tests, and reports
4	2 hours		حساب emf لبلوره البزموث	practical	Daily quizzes, monthly tests, and reports
5	2 hours		X-ray absorption part A	practical	Daily quizzes, monthly tests, and reports
6	2 hours		X-ray absorption part B	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		Electron diffraction	practical	
8	2 hours		-Zemeen effect	practical	Daily quizzes, monthly tests, and reports
9	2 hours		Space lattices and crystalline systems part A	practical	Daily quizzes, monthly tests, and reports
10	2 hours		Space lattices and crystalline systems part B	practical	Daily quizzes, monthly tests, and reports
11	2 hours		X-ray diffraction part A	practical	Daily quizzes, monthly tests, and reports
12	2 hours		X-ray diffraction part B	practical	Daily quizzes, monthly tests, and reports
13	2 hours		-Forbidden energy gap	practical	Daily quizzes, monthly tests, and reports
14	2 hours		Review	practical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	-		

11. Course Evaluation	
Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	First semester experiments booklet
Main references (sources)	Introduction to solid state physics by Charles Kittel
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
Virtual Lab
2. Course Code:
PPP 421
3. Semester / Year:
First semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Practical - 3 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Ahmed Najm Assist. Prof. Dr. Omar Abdulsada Ali omar.ab@sc.uobaghdad.edu.iq
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly

	qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours		التجربة الأولى:Density	Practical	Daily quizzes, monthly tests, and reports
2	2 hours		التجربة الثانية:Capacitors	Practical	Daily quizzes, monthly tests, and reports
3	2 hours		التجربة الثالثة:	Practical	Daily quizzes, monthly tests, and reports
4	2 hours		Alpha Decay	Practical	Daily quizzes, monthly tests, and reports
5	2 hours		التجربة الرابعة:Beer-Lambert Law	Practical	Daily quizzes, monthly tests, and reports
6	2 hours		التجربة الخامسة:Beta Decay	Practical	Daily quizzes, monthly tests, and reports
7	2 hours		Exam	Practical	
8	2 hours		التجربة السادسة:- Molecules Shapes	Practical	Daily quizzes, monthly tests, and reports
9	2 hours		التجربة السابعة:Hydrogen Atom	Practical	Daily quizzes, monthly tests, and reports

10	2 hours		التجربة الثامنة: Molecules and Light	Practical	Daily quizzes, monthly tests, and reports
11	2 hours			Practical	Daily quizzes, monthly tests, and reports
12	2 hours			Practical	Daily quizzes, monthly tests, and reports
13	2 hours		-	Practical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter6		Practical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	-		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	First semester experiments booklet
Main references (sources)	"Fundamentals Of Physics" Halliday and Resnick, Jearl Walker, 9th Ed. 2011 John Willy and sons, inc.
Recommended books and references (scientific journals, reports…)	"University Physics with Modern Physics" Sears and Zemansky's, Hugh D. Young and Roger A. Freedman, 11th E
Electronic References, Websites	Principles of Lasers ,O.Svelto, 5th Edition , (Springer)

Fourth Stage
Second Semester

Course Description Form

37.	Course Name:
	Quantum mechanics IV
38.	Course Code:
	PQM **408**
39.	Semester / Year:
	Second semester / 2024-2025
40.	Description Preparation Date:
	1-10-2024
41.	Available Attendance Forms:
	Weekly
42.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
43.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Ali Abdul Latif Karim Assist. Prof. Dr. Firas Zuhair Majeed	
44.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

45. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

46. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1	Approximation method I: Time independent perturbation theory: Non-degenerate systems	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		Degenerate systems.	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	=	Stark effect	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter 2	The fine structure of Hydrogen.	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		The Zeeman effect.	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours		Hyper fine splitting.	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	=	Approximation method II: The variational method		
8	2 hours	Chapter 3	-The ground state of Helium	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	**Chapter 4**	The Hydrogen molecule atom.	Theoretical	Daily quizzes, monthly tests, and reports

10	2 hours	=	monthly exam	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Monthly Exam	Approximation method III: Time dependent perturbation theory:	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter 5	Perturbation that are harmonic in time.	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	**Chapter6**	-Sudden perturbation.	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Chapter6	Emission and absorption of radiation.	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	Application of Perturbation theory. -		
16			Approximation method I: Time independent perturbation theory: Non-degenerate systems		

47. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

48. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Quantum Mechanics, D. J. Grifiths , 2nd Edition.
Main references (sources)	Introduction to quantum mechanics, Dick and Wittike
Recommended books and references (scientific journals, reports…)	Introduction to quantum mechanics, D. Park
Electronic References, Websites	Wikipedia

Course Description Form

37.	Course Name:
	Nuclear Physics II
38.	Course Code:
	PNP 402
39.	Semester / Year:
	Second semester / 2024-2025
40.	Description Preparation Date:
	1-10-2024
41.	Available Attendance Forms:
	Weekly
42.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
43.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Asia Hamid Khalaf Prof. Dr. Ghaith Ne'mah Falih	
44.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

45. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

46. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter 1 Nuclear model	Liquid drop model (Semi empirical mass formula, successes and failures of Liquid drop model	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	=	Fermi gas model	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	=	Simple shell model (Basic assumptions of the simple shell model), Harmonic oscillator potential	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	=	Spin-orbit potential, successes and failures of the simple shell model	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	=	Extended of the assumption of the shell model, Collective model	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Chapter2 Decay Processes	Natural Radioactivity	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	=	Alpha decay, Applications		
8	2 hours	=	-Beta decay, Type of beta decay, Neutrino hypothesis, Conservation laws	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Monthly Exam	Monthly Exam in chapter 1 and lectures No. (6-8) of chapter 2.	Theoretical	Daily quizzes, monthly tests, and reports

10	2 hours	Cont. of Chapter2 Decay Processes	Energy of beta decay, Classification of beta decay, Selection rules for beta decay, Outline for Classification of beta decays, Applications	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	=	Gamma decay, Selection rules for gamma decay, Internal conversion, Applications	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Chapter 3 Nuclear reactions	Type of nuclear reactions: (Reactions based on the reaction mechanism, Reactions based on the mass of the projectile)	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	=	-Conservation laws in nuclear reactions, Compound nucleus	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	=	Nuclear fission, Nuclear fusion, Stellar burning: (Proton-Proton Cycle, Carbone-Nitrogen Cycle, Deuteron- Deuteron Cycle	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Monthly Exam	-Monthly Exam in lectures No. (10 and 11) of chapter 2 and Chapter 3.		

47. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

48. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introductory: Nuclear Physics
Main references (sources)	References: 1. Nuclear Physics Concept, By Walter E. Meyerhof.
Recommended books and references (scientific journals, reports…)	Introductory: Nuclear Physics, By Krane.
Electronic References, Websites	Lecture Notes of Massachusetts Institute Technology.

Course Description Form

37.	Course Name:
	Solid state Physics II
38.	Course Code:
	PSS 404
39.	Semester / Year:
	Second semester / 2024-2025
40.	Description Preparation Date:
	1-10-2024
41.	Available Attendance Forms:
	Weekly
42.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
43.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Farah Tariq Muhammad Nouri Prof. Dr. Iftikhar Mahmoud	
44.	Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

45. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

46. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Band theory	Energy levels and energy bands, Nearly free electron model, Bragg reflection and energy gap, Bloch function	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Band theory	Kronig-Penney model, Brillouin zones, Fermi surfaces, effective mass, Hall effect.	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Semiconductor crystals	Intrinsic semiconductor, Direct and indirect absorption, Intrinsic carrier concentration, Extrinsic semiconductor	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Semiconductor crystals	N-type semiconductor, p-type semiconductor, Concentration of electrons and holes in doped semiconductor, mobility, electrical conductivity, Photoconductivity, Exciton.	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Crystal Defect	Point defect in a lattice, Diffusion, Dislocation (line imperfection, Edge dislocation, Screw dislocation, Burger's vector, dislocation movement	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Crystal Defect	Surface defects (Planar defects), Stacking faults, Grain Boundaries, Volume defects (Bulk defects).	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	Exam	Band theory +Semiconductor crystals+ Crystal Defect		

8	2 hours	Superconductivity	- Applications of Superconductivity, Superconducting Properties: Critical Temperature, Superconductivity	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Supperconductiviy	Critical Magnetic field, Critical current density, Meissner Effect, Penetration depth, BCS Theory of	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	Supperconductiviy	Coherence length, Types of Superconductors, Perovskite, Superconductivity in high temperature superconductor	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Magnetic Properties of Solids	, Diamagnetic materials, Paramagnetic material, Curie's law, Ferromagnetic materials	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Magnetic Properties of Solids	Bloch wall, Antiferromagnetism Ferrimagnetism, Magnetic Resonance	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Magnetic Properties of Solids	ESR (electron spin resonance) - NMR (nuclear magnetic resonance	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Review	All the objects	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Exam	- Superconductivity+ Magnetic Properties of Solids		
16					

47. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

48. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1- Kittle , C., " Introduction to Solid State Physics" 8th ed., 2007 Wiley Western Limited, New York . 2- Omar, MA., " Elementary Solid State Physics"
Main references (sources)	1- Om Prakash Pahuja "Solid State Physics" Laxmi Publications (P) LTD 1st ed., 2005 , New Delhi. 2- Ziman, Z.M., "Principles of the theory of solids" Cambridge, 1964 3- Peter M., Lectures at Manchester University 2006
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

37.	Course Name:
	Plasma Physics
38.	Course Code:
	PPaP 410
39.	Semester / Year:
	Second Semester / 2024-2025
40.	Description Preparation Date:
	1-10-2024
41.	Available Attendance Forms:
	Weekly
42.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
43.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Qusay Adnan Prof. Dr. Saba Jawad Kazem	
44.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

45. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

46. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Plasma Physics	-Introductory concepts	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Plasma Physics	- - What is plasma? - - Historical Summary - Ionization and Recombination	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Plasma Physics	- - Methods of Ionization - - Concept of Temperature - Plasma as State of Matter	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Plasma Physics	- - Self and Non-self-Maintaining Discharges. - - Saha Equation -Paschen's Law and "The "Paschen Curve"	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Plasma Physics	- - Debye Shielding - - The Plasma Parameter - Criteria for Plasmas	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Plasma Physics	- - The Ideal Plasma -Methods of Plasma Generation - Gaseous Discharge	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	Plasma Physics	- Examination I		
8	2 hours	Plasma Physics	- G- low Discharge - P- plasma Diagnostics - - Remote Diagnostics	Theoretical	Daily quizzes, monthly tests, and reports

			- - Local Diagnostics -		
9	2 hours	Plasma Physics	-Plasmas as Collection of Individual Particles - Single-Particle Motions - Uniform E and B Fields	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	Plasma Physics	- G- Gravitational Field - - Non Uniform E and B Fields - Magnetic Mirrors	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Plasma Physics	- Plasma as Fluid - The Fluid Equation of Motion - Comparison With Ordinary Hydrodynamics	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Plasma Physics	- - The Continuity Equation - - Equation of state - The complete set of fluid equations	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Plasma Physics	- Fluid drifts ⊥ to B - Fluid Drifts ∥ to B - The Plasma Approximation -Plasma Oscillations	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Plasma Physics	- Examination II	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	exam	-		
16					

47. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

48. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1-Introduction to Plasma Physics and Controlled Fusion by Chen,1985.
Main references (sources)	2-Physics of Ionized Gases, by B. M. Smirnov,2001. 3-Plasma Physics: An Introduction Course, by R. Dendy, 1999. 4-Introduction to Plasma Physics, by R. Fitz Partik. And other books
Recommended books and references (scientific journals, reports...)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

37.	Course Name:
	Electromagnetic Theory II
38.	Course Code:
	PET 406
39.	Semester / Year:
	Second Semester / 2024-2025
40.	Description Preparation Date:
	1-10-2024
41.	Available Attendance Forms:
	Weekly
42.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
43.	Course administrator's name (mention all, if more than one name)
Prof. Dr. Thamer Hamid Khalaf Assist. Prof. Dr. Muzaffar Fouad Jameel	
44.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

45. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

46. Course Structure

Week	Hours	Static Potentials with Sources – Poisson's Equation:	Image charges: The infinite conducting plane.	Learning method	Evaluation method
1	2 hours	Image charges:	The conducting sphere, The conducting cylinder and image line charges**.**	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours	Static Electromagnetic Fields in Matter:	The Electric Field Due to a Polarized Dielectric, Description of dielectrics, The electric displacement field.	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours	Static Electromagnetic Fields in Matter:	Magnetic Induction Field Due to a Magnetized Material, Magnetic field intensity, The Hysteresis Curve of a Ferromagnetic.	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Time-Dependent Electric Fields in Matter:	Maxwell's Equations**,** Energy of electric and magnetic field, The electromagnetic potentials. Plane waves in material media. Plane waves in tenuous plasma.	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours	Discussion	Discussion for the previous subjects.	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Examination	Examination in the previous subjects.	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours	Waveguide Propagation:	Bounded waves, TM modes in a rectangular waveguide.		
8	2 hours	Waveguide Propagation:	-Cylindrical waveguides, Dielectric waveguides (optical fibers)	Theoretical	Daily quizzes, monthly tests,

					and reports
9	2 hours	Electromagnetic radiation:	The inhomogeneous wave equation, Radiation from localized oscillating source.	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours	Electromagnetic radiation:	Electric dipole radiation, Radiation reaction, Electromagnetic inertia, The reaction force needed to conserve energy.	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Direct Calculation of Radiation Reaction:	The Abraham-Lorentz model, The equation of motion.	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours	Discussion.	Discussion for the previous subjects.	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Examination.	-Examination in the previous subjects.	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours	Examination.	Examination in all the previous subjects.	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours	Static Potentials with Sources – Poisson's Equation:	-Image charges: The infinite conducting plane.		
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47. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

48. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Classical Electromagnetic Theory, *by* Jack Vanderlinde, 2005 Springer Science.
Main references (sources)	1. Classical Electromagnetic Theory, *by* Jack Vanderlinde, 2005 Springer Science. 2. Introduction to Electrodynamics, by David Griffiths, prentice-Hall, 1999.
Recommended books and references (scientific journals, reports…)	1- Introduction to Electrodynamics (Instructor's Solutions Manual), by David Griffiths, 2004.
Electronic References, Websites	12- http://www.clerkmaxwellfoundation.org/html/electromagnetic_theory.html https://www.sciencedirect.com/topics/computer-science/electromagnetic-theory

Course Description Form

37.	Course Name:
	Nano technology II
38.	Course Code:
	PES 412-1
39.	Semester / Year:
	Second Semester / 2024-2025
40.	Description Preparation Date:
	1-10-2024
41.	Available Attendance Forms:
	Weekly
42.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Units
43.	Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Manal Midhat Abdullah	
44.	Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the

	department to be efficient faculty members in the future - Achieving quality and academic accreditation

45. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

46. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours	Chapter one	**Introduction to Nanotechnology**	Theoretical	Daily quizzes, monthly tests, and reports
2	2 hours		Properties of Nanomaterials Surface area-to-volume ratio Quantum size effects Mechanical, electrical, thermal, and optical properties at the nanoscale	Theoretical	Daily quizzes, monthly tests, and reports
3	2 hours		Synthesis of Nanomaterials – Top-Down Approaches Mechanical milling Lithography (photolithography, electron-beam lithography) Etching and patterning techniques	Theoretical	Daily quizzes, monthly tests, and reports
4	2 hours	Chapter Two	Synthesis of Nanomaterials – Bottom-Up Approaches Chemical vapor deposition (CVD) **Sol-gel processing**	Theoretical	Daily quizzes, monthly tests, and reports
5	2 hours		Characterization Techniques Scanning Electron Microscopy (SEM)	Theoretical	Daily quizzes, monthly tests, and reports
6	2 hours	Chapter Three	Transmission Electron Microscopy (TEM)	Theoretical	Daily quizzes, monthly tests, and reports
7	2 hours		Atomic Force Microscopy (AFM) exam1		

8	2 hours		Characterization Techniques -X-Ray Diffraction (XRD)	Theoretical	Daily quizzes, monthly tests, and reports
9	2 hours	Chapter four	UV-Vis and FTIR spectroscopy	Theoretical	Daily quizzes, monthly tests, and reports
10	2 hours		Carbon Nanostructures Fullerenes, carbon nanotubes (CNTs), graphene Properties, synthesis, and applications	Theoretical	Daily quizzes, monthly tests, and reports
11	2 hours	Chapter five	Nanomaterials in Electronics and Photonics Nanoscale transistors and memory devices Quantum dots, photonic crystals Nano-optoelectronics	Theoretical	Daily quizzes, monthly tests, and reports
12	2 hours		Nanotechnology in Medicine and Biology Drug delivery systems Biosensors and diagnostic devices Nanotoxicology and ethical considerations	Theoretical	Daily quizzes, monthly tests, and reports
13	2 hours	Chapter six	Applications -	Theoretical	Daily quizzes, monthly tests, and reports
14	2 hours		Seminar Presentation by students	Theoretical	Daily quizzes, monthly tests, and reports
15	2 hours		-**exam 2**		
16					

47. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

48. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Introduction to Nanotechnology Authors: Charles P. Poole Jr. & Frank J. Owens Publisher: Wiley-Interscience Year: 2003

Main references (sources)	Nanotechnology: Principles and Practices Author: Sulabha K. Kulkarni Publisher: Springer Edition: 3rd Edition Year: 2014
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
(Practical Physics VIII) Nuclear Physics
2. Course Code:
PPP 422
3. Semester / Year:
Second Semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Practical - 3 Units
7. Course administrator's name (mention all, if more than one name)
Prof. Dr. Wasan Zuhair Majeed A. Prof. Dr. Haider Salim Hussein A. Nisreen Bahjat
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country

	- Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours		Introduction	practical	Daily quizzes, monthly tests, and reports
2	2 hours		Radiation Interaction	practical	Daily quizzes, monthly tests, and reports
3	2 hours		Experiment 1 Gamma Ray Attenuation	practical	Daily quizzes, monthly tests, and reports
4	2 hours		Experiment 2 Radioactivity	practical	Daily quizzes, monthly tests, and reports
5	2 hours		Experiment 3 Scintigraphy Efficiency	practical	Daily quizzes, monthly tests, and reports
6	2 hours		Experiment 4 Exposure	practical	Daily quizzes, monthly tests, and reports
7	2 hours		Experiment 5 Brake Rays	practical	
8	2 hours		Experiment 6 Compton Scattering	practical	Daily quizzes, monthly tests, and reports
9	2 hours		Experiment 7 Aggregate Factor	practical	Daily quizzes, monthly tests,

					and reports
10	2 hours		Experiment 8 Differential Spectroscopy	practical	Daily quizzes, monthly tests, and reports
11	2 hours		Experiment 9 Beta Diffraction	practical	Daily quizzes, monthly tests, and reports
12	2 hours		Experiment Review	practical	Daily quizzes, monthly tests, and reports
13	2 hours		Midterm Exam	practical	Daily quizzes, monthly tests, and reports
14	2 hours			practical	Daily quizzes, monthly tests, and reports
15	2 hours	**Exam**	-		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Nuclear Laboratory Workbook
Main references (sources)	- Experimental Nuclear Physics / Dr. Ali Attia - Nuclear Radiation Detection / Dr. Shaza Al-Darkazli
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

1. Course Name:
(Practical Physics VIII) Solid State Physics
2. Course Code:
PPP 422
3. Semester / Year:
Second Semester / 2024-2025
4. Description Preparation Date:
1-10-2024
5. Available Attendance Forms:
Weekly
6. Number of Credit Hours (Total) / Number of Units (Total):
2 Theoretical - 2 Practical - 3 Units
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Suad Salman Ahmed Prof. Dr. Osama Natiq Naji Assist.Prof.Dr. Ban Mazen Muzahim
8. Course Objectives

Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country

	- Meeting the needs of multiple sectors in the field of physics with highly qualified cadres - Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

9. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours		Definition of second course experiments and distribution of experiments	practical	Daily quizzes, monthly tests, and reports
2	2 hours		absorption spectrum	practical	Daily quizzes, monthly tests, and reports
3	2 hours		Measuring the electrical properties of a Ferroelectric material	practical	Daily quizzes, monthly tests, and reports
4	2 hours		Measuring the difference between the normal and supernormal refractive index of quartz crystals تر part A	practical	Daily quizzes, monthly tests, and reports
5	2 hours		قMeasuring the difference between the normal and supernormal refractive index of quartz crystals ي و part B	practical	Daily quizzes, monthly tests, and reports
6	2 hours		Hall effect part A	practical	Daily quizzes, monthly tests, and reports
7	2 hours		Hall effect part B	practical	
8	2 hours		- خليه الشمسيه part A	practical	Daily quizzes, monthly tests, and reports
9	2 hours		خليه الشمسيه part B	practical	Daily quizzes, monthly tests,

					and reports
10	2 hours		Electron spin resonance part A	practical	Daily quizzes, monthly tests, and reports
11	2 hours		Electron spin resonance part B	practical	Daily quizzes, monthly tests, and reports
12	2 hours		Review	practical	Daily quizzes, monthly tests, and reports
13	2 hours		-	practical	Daily quizzes, monthly tests, and reports
14	2 hours		Exam	practical	Daily quizzes, monthly tests, and reports
15	2 hours		-		
16					

11. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Laboratory Workbook
Main references (sources)	Introduction to solid state physics by Charles Kittel
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia

Course Description Form

13.	Course Name:
	(Practical Physics VIII) Virtual Lab
14.	Course Code:
	PPP 422
15.	Semester / Year:
	Second Semester / 2024-2025
16.	Description Preparation Date:
	1-10-2024
17.	Available Attendance Forms:
	Weekly
18.	Number of Credit Hours (Total) / Number of Units (Total):
	2 Theoretical - 2 Practical - 3 Units
19.	Course administrator's name (mention all, if more than one name)
Prof, Dr. Ahmed Najim Abdullah Assist. Prof. Dr. Omar Abdulsada Ali	
20.	Course Objectives
Course Objectives	- Teaching students the basic principles of physics - Preparing specialists in nanotechnology physics and its practical applications who are responsible for studying the country's need for development and progress and are able to meet the needs of the labor market in state institutions and industrial sectors - Preparing an educated generation armed with science and the edges of science and adopting it as a sound basis for bringing about radical changes and placing scientific knowledge and the scientific method in thinking, analysis and adaptation to the development of technologies in order to keep pace with the expansion of human needs. - Effective contribution to deepening and documenting the university's relationship with society through implementing consulting work, training, and developing teaching and administrative cadres. - Preparing graduates specialized in physics who contribute to the development of the country - Meeting the needs of multiple sectors in the field of physics with highly qualified cadres

	- Encouraging distinguished people in this field to work as lecturers in the department to be efficient faculty members in the future - Achieving quality and academic accreditation

21. Teaching and Learning Strategies

Strategy	- Teaching solid-state physics effectively requires a mix of conceptual explanations, mathematical rigor, and practical applications. - Definition crystal structure of solid identification of solid state physics. - Start with an intuitive introduction to key concepts like crystal structures, symmetry, wave velocity, Magnetic Properties of Solids, dielectric and optical properties, Band theory of solids and Nanostructure.

22. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hours		Definition of second course experiments and distribution of experiments	practical	Daily quizzes, monthly tests, and reports
2	2 hours		Density	practical	Daily quizzes, monthly tests, and reports
3	2 hours		Capacitors	practical	Daily quizzes, monthly tests, and reports
4	2 hours		Curve fitting 1	practical	Daily quizzes, monthly tests, and reports
5	2 hours		Curve fitting 2	practical	Daily quizzes, monthly tests, and reports
6	2 hours		Bohr model	practical	Daily quizzes, monthly tests, and reports
7	2 hours		**Mid term Exam**	practical	
8	2 hours		Schrodinger Model	practical	Daily quizzes, monthly tests, and reports
9	2 hours		Stern Gerlach	practical	Daily quizzes, monthly tests, and reports

10	2 hours		**Molecules Shape**	practical	Daily quizzes, monthly tests, and reports
11	2 hours		Molecules and Light	practical	Daily quizzes, monthly tests, and reports
12	2 hours		Review	practical	Daily quizzes, monthly tests, and reports
13	2 hours		Forier Transformation	practical	Daily quizzes, monthly tests, and reports
14	2 hours		Exam	practical	Daily quizzes, monthly tests, and reports
15	2 hours		-		

23. Course Evaluation

Distributing the score out of 40% according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports…. etc. and the final exam 60%.

24. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Laboratory Workbook
Main references (sources)	Introduction to solid state physics by Charles Kittel
Recommended books and references (scientific journals, reports…)	Researchgate, Scopes, Web of Science, Wikipedia
Electronic References, Websites	Wikipedia