

Republic of Iraq
Ministry of Higher Education & Scientific Research
Supervision and Scientific Evaluation Directorate
Quality Assurance and Academic Accreditation

Academic Program Specification Form For The Academic

University: *Anbar*
College : *Education for Pure Science*
Department : *Physics*
Date Of Form Completion : *10/6/2023*


Prof. Dr. Abdul Rahman
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Dean's Name

Dean's Assistant
For Scientific
Affairs

Head of
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Date: *10/6/2023*
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Date: *10/6/2023*
Signature





TEMPLATE FOR PROGRAMME SPECIFICATION

HIGHER EDUCATION PERFORMANCE REVIEW: PROGRAMME REVIEW

PROGRAMME SPECIFICATION

This Programme Specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. It is supported by a specification for each course that contributes to the programme.

1. Teaching Institution	University of Anbar
2. University Department/Centre	College of Education for Pure Sciences \ Department of Physics
3. Programme Title	Education in Physical Science
4. Title of Final Award	Bachelor of Science in Physics Education
5. Modes of Attendance offered	Semester
6. Accreditation	Nothing
7. Other external influences	Late start of the academic year for first-year students
8. Date of production	10/6/2022

9. Aims of the Programme

1. Achieving the specified standards for the quality of material, human, technical and financial resources.
2. Providing an efficient administrative cadre that knows its duties and powers in accordance with the work structures and regulations, in which the requirements of the job description are fulfilled.
3. Providing a specialized teaching staff who is fluent in using modern techniques and methods in education with good job satisfaction.
4. Preparing academic programs in accordance with international academic standards and providing their knowledge, training and technical requirements.
5. Preparing students with scientific, practical and educational knowledge that meets the needs of the labor market.
6. Paying attention to scientific research in terms of laboratory, research and researcher in order to achieve a distinguished research reputation locally and globally.
7. Research and professional openness to community institutions to meet their needs and aspirations.
8. Evaluate all individuals and processes to ensure quality performance and continuous improvement

10. Learning Outcomes, Teaching, Learning and Assessment Methods

A. Knowledge and Understanding

- A 1- That the student understand physics and its theoretical and applied branches
- A2- That the student can teach physics to the intermediate and preparatory stages
- A 3- The student understands the individual differences between students
- A4- That the student understand the correct foundations of scientific research

B. Subject-specific skills

- B1 - That the student be able to work on qualifying himself to become a successful educational and scientific leader
- B 2 - to teach the student the correct foundations in order to become a successful teacher of physics
- B 3 - That the student learn the correct scientific method in scientific research.
- B4 - Enabling students to acquire the skills of using virtual classrooms

Teaching and Learning Methods

- Classroom lectures.
- Reports and research.
- Using a variety of modern teaching methods.
- Practical laboratories

Assessment methods

- The treatment methods using final scores.
- Random and surprise tests.
- Monthly theoretical and practical tests in the taught curriculum.

C. Thinking Skills

- C-1. Adopting the method of dialogue between the student and the professor.
- C-2.- loving their assigned work
- C-3. loving knowledge acquired by them
- C-4. Adopting e-learning to provide an interesting and flexible learning environment..

Teaching and Learning Methods

- Classroom lectures.
- Reports and research.
- Using a variety of modern teaching methods.
- Practical laboratories

Assessment methods

1. Monthly theoretical and practical tests in the taught curricula.
2. Duties
3. Class participation

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1- That the student benefit from his learning and embody this in his personal and professional development.

D2- That the student is able to employ the knowledge he receives during the study stage.

D3- That the student benefit from theoretical knowledge in employing the teaching profession and mastering it in a concept-based manner.

Fundamentals of teaching physics.

D4 - Skills of modern technologies in communication, documentation and communication.

Teaching and Learning Methods

1. Field visits to laboratories.
2. Scientific applications in laboratories.
3. Take advantage of graduation research.
4. Present educational contents in virtual classes using multimedia (video, recorded lecture)

Assessment Methods

1. Articles and periodical research
2. The interview
3. Final exams
4. Determining study tasks and duties periodically and regularly in the virtual classroom

11. Programmer Structure

Level/ Year	Course or Module Code	Course or Module Title	Weekly hours	
			Lec.	Lab.
First	PHE121	Electricity	2	3
	PHE122	Magnetism	2	-
	PHE123	Mechanic 1	3	3
	PHE124	Mechanic 2	3	3
	PHE125	Optical engineering	3	3
	PHE126	Heat and Properties of Matter	2	-
	PHE127	Mathematics 1	2	-
	PHE128	Liner algebra	2	-
	EPS101	Educational Psychology	2	-
	EPS102	Fundamentals of Education	2	-
	UOA135	Human rights	1	-
	UOA136	Democracy	1	-
	UOA137	Computer science	2	-
	UOA141	Computer science	2	-
	UOA104	English language	2	-
Second	PHE221	Optical physics	3	3
	PHE222	Advance Electric	3	3
	PHE223	Advance magnetic	3	3
	PHE224	Sound and wave motion	2	-
	PHE225	Advance calculus	3	-
	PHE226	Deferential equation	3	-
	EPS202	Growth psychology	2	-
	EPS201	Educational administration	2	-
	EPS211	Methods of Scientific Research	2	-
	PHE227	Healthy physics	2	-
	PHE228	Astronomy physics	2	-
	PHE229	Space physics	2	-
	UOA214	Programming	2	-
	UOA240	English language 2	2	-

Third	PHE321	Atomic physics	3	3
	PHE322	Molecular physics	3	3
	PHE323	Electronics	3	3
	PHE324	Electronic circuit	3	3
	PHE325	Quantum mechanics 1	2	-
	PHE326	Analytical mechanics	2	-
	PHE327	Complex function	2	-
	PHE328	Statistical mechanic	3	-
	PHE329	New and renew energy	2	-
	PHE330	Crystals	2	-
	PHE331	Sets theory	2	-
	EPS 311	Curricula and Methodology	2	
	EPS 312	Educational Counselling and Psychological Health	2	
	UOA340	English language 3	2	
	Fourth	PHE421	Solid state physics 1	3
PHE422		Solid state physics 2	3	-
PHE423		Quantum mechanics 2	2	-
PHE424		Nuclear physics	3	3
PHE425		Radiation physics	3	3
PHE426		Electromagnetic	3	3
PHE427		Electrodynamics	3	3
PHE428		Laser physics 1	2	-
PHE429		Classroom Observation	-	2
PHE430		Nanotechnology	2	-
EPS411		Measurement and Evaluation	2	-
EPS412		Teaching Practicum	2	-
EPS413		Classroom Observation	-	4
EPS414		Graduation Research Project	2	-
UOA440		English language 4	2	-

13. Personal Development Planning

1. Using modern scientific sources.
2. Using rapid communication networks to transfer information such as the Internet.
3. Visits and practical practices in service laboratories.
4. Acquisition of scientific and modern experiences and skills in the field of modern technical communication

14. Admission criteria

1. Admission according to the general and central grade system.
2. Admission to departments is according to the student's desire and is modified.
3. The condition for graduating middle school and the scientific background must be exclusively
4. To require a personal interview with the department.
5. The grade of high school.
6. The carrying capacity of the college

15. Key sources of information about the programmer

1. Curriculum books approved by the Scientific Committee of the Faculties of Education for Pure Sciences.
2. Helping books.
3. Books and archaeological resources / sources in the English language.
4. Additional sources from the Internet.
5. The training courses held by the university on e-learning platforms.

Curriculum Skills Map																			
				Programmer Learning Outcomes															
Year / Level	Course Code	CourseTitle	Core (C) or Option (O)	Knowledge and understanding				Subject-specific skills				Thinking Skills				General and Transferable Skills (or) Other skills relevant to employability and personal development			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4
First	PHE121	Electricity	Core	✓	✓		✓		✓			✓					✓		
	PHE122	Magnetism	Core	✓	✓		✓		✓			✓					✓		
	PHE123	Mechanic 1	Core	✓	✓		✓		✓			✓					✓		
	PHE124	Mechanic 2	Core	✓	✓		✓		✓			✓					✓		
	PHE125	Optical engineering	Core	✓	✓		✓		✓			✓					✓		
	PHE126	Heat and Properties of Matter	Core	✓	✓		✓		✓			✓					✓		
	PHE127	Mathematics 1	Core	✓	✓		✓		✓			✓					✓		
	PHE128	Liner algebra	Core	✓	✓		✓		✓			✓					✓		
	EPS101	Educational Psychology	Core			✓		✓					✓	✓		✓		✓	
	EPS102	Fundamentals of Education	Core			✓		✓					✓	✓		✓		✓	
	UOA135	Human rights	Core			✓		✓		✓		✓	✓	✓		✓		✓	
	UOA136	Democracy	Core			✓		✓				✓	✓	✓		✓		✓	
	UOA137	Computer science	Core		✓		✓	✓										✓	
	UOA141	Computer science	Core				✓	✓		✓	✓				✓				✓
UOA140	English language	Core				✓	✓		✓					✓				✓	

Curriculum Skills Map																				
				Programme Learning Outcomes																
Year / Level	Course Code	CourseTitle	Core (C) or Option (O)	Knowledge and understanding				Subject-specific skills				Thinking Skills				General and Transferable Skills (or) Other skills relevant to employability and personal development				
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4	D1	D2	D3	D4	
Second	PHE221	Optical physics	Core	✓	✓				✓			✓					✓	✓		
	PHE222	Advance Electric	Core	✓	✓				✓			✓					✓	✓		
	PHE223	Advance magnetic	Core	✓	✓				✓			✓					✓	✓		
	PHE224	Sound and wave motion	Core	✓	✓				✓			✓					✓	✓		
	PHE225	Advance calculus	Core	✓	✓				✓			✓					✓	✓		
	PHE226	Deferential equation	Core	✓	✓				✓			✓					✓	✓		
	EPS202	Growth psychology	Core			✓		✓	✓			✓					✓			
	EPS201	Educational administration	Core			✓		✓	✓			✓			✓		✓			
	EPS211	Methods of Scientific Research	Core				✓	✓	✓	✓								✓		
	PHE227	Healthy physics	Option	✓	✓				✓			✓						✓		
	PHE228	Astronomy physics	Option	✓	✓				✓			✓						✓		
	PHE229	Space physics	Option	✓	✓				✓			✓						✓		
	UOA214	Programming	Core				✓	✓		✓	✓					✓				✓
	UOA240	English language 2	Core				✓									✓				✓

Course Description Form

**Review the performance of higher education institutions
((Academic Program Review))**

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

University Of Anbar	1. Educational institution
College of Education for Pure Sciences / Department of Physics	2. University Department / Center
Advanced quantum mechanics	3. Course Name/Code
B.Sc. (Third Stage)	4. Programs in which it enters
Presence	5. Available Attendance Forms
First Semester / 2022-2023	6. Semester / Year
2hours	7. Number of Credit Hours (Total)
1March. 2022	8. The history of preparation of this description
9. Course Objectives:	
The student knows The Physical Foundations of Quantum mechanics , What is the quantum mechanics Why quantum mechanics is important	

10. Learning outcomes and methods of teaching, learning and evaluation

A. Knowledge and understanding

The student may understands The paradox between classical physics and experimental physics and how quantum mechanics solving them

B. Subject-specific skills					
Development of understand to students in mathematics and quantum mechanics					
<ul style="list-style-type: none"> • Teaching and learning methods 					
- Lecture, discussion, short reports, problem solving					
<ul style="list-style-type: none"> • Evaluation methods 					
<ul style="list-style-type: none"> - Monthly test (essay and topical) -Activity -Short questions -Reports -Duties -Final Exam 					
C. Thinking skills					
- Ask various questions and brainstorm					
-					
<ul style="list-style-type: none"> • Teaching and learning methods 					
- Discussion, lecture, questioning					
<ul style="list-style-type: none"> • Evaluation methods 					
1. Achievement Tests					
2. Test methods (interview and observation)					
3. Student feedback					
D. General and transferable Skills (other skills related to employability and personal development).					
Q.M. needs to mathematical and understanding to all laws in classical physics .					

11. Course Structure

Evaluati on method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
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Short questions	Lecture	The paradox between classical physics and experimental physics		2	1
Short questions	Lecture	The Physical Foundations of Quantum mechanics What is the quantum mechanics Why quantum mechanics is important		2	2
Short questions	Lecture	Wave-particle duality Heisenberg uncertainty principle Correspondence Principle		2	3
Short questions	Lecture	Elementary Properties of Quantum Mechanics		2	4
Short questions	Lecture	Introduction, Wave function in quantum mechanics Normalization condition , Orthogonality condition and orthonormal condition of wave functions.		2	5
		Test 1		2	6
Short questions	Lecture	Normalized functions		2	7

		Eigenvalues Eigenfunctions Expected Value			
Short questions	Lecture	Eigenfunctions and constants of motion Solution of dependent Schrodinger equation		2	8
Short questions	Lecture	Characteristics of energy levels and wave function		2	9
Short questions	Lecture	Schrodinger equation Types of Schrodinger equations How one get of any type of Schrodinger equation		2	10
Short questions	Lecture	One-dimensional solution of Schrodinger equation to free particle		2	11
		One-dimensional solution of Schrodinger equation to Infinite square well		2	12
Short questions	Lecture	One-dimensional solution of Schrodinger equation to finite square well		2	13
Short questions	Lecture	Examples		2	14
		Test 2		3	15

12. Infrastructure	
<p>Principles of Quantum Mechanics , by Salim AlSHamaya , University of Mosul , 1988.</p> <p>Quantum Mechanics by L. I. Schif</p> <p>Quantum Mechanics by S. Allayani , KSA.</p>	<p>Required readings :</p> <ol style="list-style-type: none"> 1. Course Books 2. Other
<ul style="list-style-type: none"> • PowerPoint 	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)

13. Acceptance	
	Prerequisites
25	Minimum number of students
50	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve. Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

Ministry of Higher Education and Scientific Research / Anbar University	14. Educational institution
College of Education for Pure Sciences / Department of Physics	15. University Department / Center
Nuclear Physics	16. Course Name/Code
Bachelor / First Level	17. Programs in which it enters
Presence	18. Available Attendance Forms
First Semester /fourth / 2022-2023	19. Semester / Year
3 hours theoretical + 3 hours practical / week * 15 weeks = 90 hours / semester	20. Number of Credit Hours (Total)
22-6-2022	21. The history of preparation of this description
22. Course Objectives:	
(a) The student knows the nature of the nucleus and nuclear force and studies its properties	
(b) The student should know the behavior and nature of the nucleus	
(c) Study of the most important nuclear models	
(d) The student gets to know the types of nuclear radiation	
(e) Study of nuclear reactions and the types and forms of these reactions	

23. Learning outcomes and methods of teaching, learning and evaluation

E. Knowledge and understanding

1. - The student understands the different uses of nuclear rays
2. - The student distinguishes between nuclear rays

F. Subject-specific skills

- 1-. Lectures
2. Duties and exercises
3. discussion

- **Teaching and learning methods**

- Lecture, discussion, short reports, problem solving

- **Evaluation methods**

- Monthly test (essay and topical)
- Activity. -Short questions. -Reports .. Duties
- Final Exam

G. Thinking skills

- Ask various questions and brainstorm

- **Teaching and learning methods**

- Discussion, lecture, questioning

- **Evaluation methods**

4. Achievement Tests. Test methods (interview and observation)
5. Student feedback

H. General and transferable Skills (other skills related to employability and personal development).

1. Verbal teaching behavior skills such as discussion, dialogue, explanation and interpretation.
2. Non-verbal teaching behavior skills, such as visual contact between the teacher and the student, and use of illustrations such as educational videos and pictures
3. Planning skill: such as the skill of determining the subject of the lesson, using appropriate means, preparing questions
4. Implementation skills: such as stimulating students' motivation, controlling and managing the classroom
5. Evaluation skills: such as preparing monthly tests, essays, objective

24. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Short questions with homework solving	Lecture + Lab	Basic concepts in nuclear physics	The force that binds the components of the nucleus	3 theoretical 3 Practical	1
Short questions with homework solving	Lecture + Lab	Kinetic properties of the nucleus - terminology - solving problems in the first chapter	Distinguish between nuclei	3 theoretical 3 Practical	2
Short questions	Lecture + Lab	Chapter Two // Nuclear structure: nuclear binding energy - average binding energy - separation energy systematics	Nuclear programmes	3 theoretical 3 Practical	3
Short questions	Lecture + Lab	Nuclear models (liquid drop model - shell model)	Nuclear models	3 theoretical 3 Practical	4
Short questions in addition to assignments	Lecture + Lab	Other nuclear models) mass parabola - stability line	Stable nuclei	3 theoretical 3 Practical	5
solving questions		solving equations	Solve the problems of the second chapter	3 theoretical 3 Practical	6
Attendance test (various questions)		Semester Exam	Second month exam	2hr theoretical 3 Practical	7
Short questions	Lecture + Lab	Chapter Three / Nuclear Reactions - Application of conservation laws - Types of nuclear reactions	Types of interactions	3 theoretical 3 Practical	8
Show video	Lecture + Lab	Composite nuclei- Cross-sectional area - reactions	Complex nucleus	3 theoretical 3 Practical	9

Short questions and show video	Lecture + Lab	Nuclear fission -The energy released in fission	Nuclear fission	3 theoretical 3 Practical	10
show video	Lecture + Lab	Definition of nuclear fusion - article	Nuclear fusion	3 theoretical 3 Practical	11
Presentation of a diagram of nuclear reactor with an explanatory film	Lecture + Lab	Chapter Four/ Nuclear reactors - their types - their composition - their uses	Types of reactors	3 theoretical 3 Practical	12
Presentation of a diagram of particle accelerator with an explanatory film	Lecture + Lab	Chapter Five: Charged particle accelerators - their types - their composition - how they work - their uses	Nuclear accelerators	3 theoretical 3 Practical	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review	*The student's understanding of the material tucked during the semester * The student's knowledge to link all of the above		15

25. Infrastructure	
1. Principles of Nuclear Physics, written by Meyerhof 2. Introduction to Atomic and Nuclear Physics, written by Anka, translated by Assem Azouz 3. -Internet - periodicals and references	Required readings : 3. Course Books 4. Other
Power Point ,Various radioactive sources, Giger- Miler counter	Special Requirements
A comparative study of student projects submitted to complete the prescribed curriculum through reports on specialized topics, and Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)

26. Acceptance	
Atomic physics	Prerequisites
Theoretical: 30 students Practical: 20 students	Minimum number of students
Theoretical: 50 students Practical: 20 students	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

1.Educational institution	Ministry of Higher Education and Scientific Research / Anbar University
2.University Department/Center	College of Education for Pure Sciences / Department of Physics
3.Course Name/Code	Statistical Mechanics
4.Programs in which it enters.	Bachelor degree
5.Available Attendance Forms	Weekly / Theoretical
6.Semester/Year	Quarterly
7.Number of credit hours (total)	2
8.Date of preparation of this description	2022-2023
27. Course Objectives:	
(f) The student should be fluent in dealing mathematically and physically with statistics	
(g) The student must be fluent in describing the motion of a system containing the number of Afkadro particles	
(h) The student should distinguish between statistical events	
(i) The student should know the statistical variables	
(j) The student must be fluent in calculating value, meanness, dispersion and standard	

28. Learning outcomes and methods of teaching, learning and evaluation

I. Knowledge and understanding

- . 1. The student should know the basic laws in statistics
- .2The student should learn how to describe the motion of the number of particles
- .3The student should distinguish between events and statistical variables

J. Skills of the subject: that the student can deal with statistical concepts to consolidate the physical result.

• Teaching and learning methods

The theoretical aspect uses the presentation of the material theoretically with the help of the presentation tool (data show) as well as drawings and illustrations.

• Evaluation methods

Theoretical tests in the curriculum taught.

K. Thinking skills

- How to answer theoretical questions.
- Provide a curriculum to support the materials received by students.
- Introducing the concepts of mechanics and their practical applications.

• Teaching and learning methods

- Knowledge of mathematical equations and rules of statistical thermodynamics and how to use them in solving questions and Issues related to the prescribed curriculum

• Evaluation methods

Daily tests in addition to the assignments related to the subject, as well as monthly tests to know what students acquire from knowledge.

2. Course Structure

The week	Hours	Required Learning Outcomes	Name of the unit/course or topic	Method of education	Evaluation method
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1	2 hours theoretical	To know the statistical events	Random and chasing events	theoretical	1
2	2 hours theoretical	To be fluent in distinguishing between statistical events	Independent events and then a comparison between events	theoretical	2
3	2 hours theoretical	To be fluent in calculating probability for all events	Probability theory	theoretical	3
4	2 hours theoretical	To distinguish the full set of events	Complete Set	theoretical	4
5	2 hours theoretical	To know the statistical variables	Discrete variables	theoretical	5
6	2 hours theoretical	To distinguish between statistical variables	Continuous variables	theoretical	6
7	2 hours theoretical	First month exam	Questions & issues	theoretical	7
8	2 hours theoretical	To be able to calculate the average value	Median value	theoretical	8
9	2 hours theoretical	To be able to calculate the dispersion	Dispersion	theoretical	9
10	2 hours theoretical	To be able to calculate the standard deviation	Standard deviation	theoretical	10
11	2 hours theoretical	To know the theory of randomness	Stochastic theory	theoretical	11
12	2 hours theoretical	To be fluent in entropy calculation	Entropy	theoretical	12
13	2 hours theoretical	To recognize statistical density	Statistical density	theoretical	13
14	2 hours theoretical	Comprehensive review and enrichment exercises	Review and solve exercises	theoretical	14
15	2 hours theoretical	Second month exam	Questions & Issues	theoretical	15

29. Infrastructure	
.Other	Required readings: Course Books. Statistical Physics Book written by Prof. Dr. Salem Al-Masri
Special Requirements	Dita Shaw
Social services (e.g. guest lectures, vocational training and field studies)	Presentation to students on applications of the concepts studied.
30. Acceptance	
Prerequisites	
Minimum number of students	20
The largest number of students	30

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

University Of Anbar	31. Educational institution
College of Education for Pure Sciences / Department of Physics	32. University Department / Center
Advanced quantum mechanics	33. Course Name/Code
B.Sc. (Fourth Stage)	34. Programs in which it enters
Presence	35. Available Attendance Forms
First Semester / 2022-2023	36. Semester / Year
2hours	37. Number of Credit Hours (Total)
1Sept. 2022	38. The history of preparation of this description
39. Course Objectives:	
The student knows operators and commutators of operators so how to solve Schrodinger equation to hydrogen atom and approximation methods in quantum mechanics	

40. Learning outcomes and methods of teaching, learning and evaluation

L. Knowledge and understanding

The student may understands how can use operators in quantum mechanics and how can applied schrodinger equation in polar coordinates and how can applied it in perturbed

systems,

M. Subject-specific skills

Development of understand to students in mathematics and quantum mechanics

- **Teaching and learning methods**

- Lecture, discussion, short reports, problem solving

- **Evaluation methods**

- Monthly test (essay and topical)
- Activity. -Short questions. -Reports. -Duties
- Final Exam

N. Thinking skills

- Ask various questions and brainstorm

- **Teaching and learning methods**

- Discussion, lecture, questioning

- **Evaluation methods**

6. Achievement Tests
7. Test methods (interview and observation)
8. Student feedback

O. General and transferable Skills (other skills related to employability and personal development).

Q.M. needs to mathematical and understanding to all laws in classical physics .

41. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Short questions	Lecture	Operators , Eigenvalue equation and commutator of operators		2	1
Short questions	Lecture	Hermitian operator : Define , conditions and examples		2	2
Short questions	Lecture	Orthonormality condition of wave functions, Super position principle in quantum mechanics and expectation value.		2	3
Short questions	Lecture	Angular momentum operators , commutators of Angular momentum operators and Examples		2	4
		Test 1		2	5
Short questions	Lecture	Spherically Symmetrical Systems : Central Force and Hydrogen atom.		2	6
Short	Lecture	Probability		2	7

questions		Density of single electron atom and Selection rules of Hydrogen atom with Examples			
Short questions	Lecture	Approximations methods in quantum mechanics: Perturbation method First Approximation (Solution of perturbed Schrodinger equation) - First order		2	8
Short questions	Lecture	Solution of second order of perturbed Schrodinger equation		2	9
Short questions	Lecture	Solution of second order of perturbed Schrodinger equation		2	10
Short questions	Lecture	Examples		2	11
		Test 2		2	12
Short questions	Lecture	Virial Method		2	13
Short questions	Lecture	WKB Method		2	14
		Examples		3	15

42. Infrastructure	
<p>Principles of Quantum Mechanics , by Salim AlSHamaya , University of Mosul , 1988.</p> <p>Quantum Mechanics by L. I. Schif</p> <p>Quantum Mechanics by S. Allayani , KSA.</p>	<p>Required readings :</p> <p>5. Course Books</p> <p>6. Other</p>
<ul style="list-style-type: none"> • PowerPoint 	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)
43. Acceptance	
	Prerequisites
25	Minimum number of students
50	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

1. Educational Institution	College Of Education For Pure Sciences/University Of Anbar
2. Scientific Department/Center	Physics
3. Course Name/Code	Solid State Physics
4. Programs in which it enters	Bachelor / First Level
5. Available Forms Of Attendance	Direct Attendance In The Classroom
6. Semester/Year	Academic Year: 2022-2023
7. Number Of Study Hours (Total)	60 Theoretical Hours + 60 Practical Hours
8. Date This Description Was Prepared	2/10/2022
9. Course Objectives:	
A- Providing The Student With Knowledge Of The Types Of States Of Matter.	
B- Providing The Student With Knowledge Of The Crystalline Structure Of Solid Materials.	
C- Providing The Student With Knowledge Of The Debye Model Of Specific Heat.	
D- Providing The Student With Knowledge Of Incompatible Crystal Reactions.	
E- Providing The Student With Knowledge In The Field Of Hall.	
F- Providing The Student With Practical Experience In Identifying The X-Ray Device And How To Use It.	
G- Providing The Student With Scientific Experience In Identifying The UV Visible Device And How To Use It.	
H- Providing The Student With Knowledge Of The Theory Of Beams In Solid Materials.	
I- Providing The Student With Knowledge Of Semiconductors.	

J- Providing The Student With Knowledge Of Crystal Defects.

10. Course outcomes and teaching, learning and evaluation methods

A. Cognitive objectives

- 1) Introducing the student to the structure of solids.
- 2) Introducing the student to states of matter.
- 3) Introducing the student to models and forms related to the composition of materials.
- 4) Introducing the student to the field of hall.
- 5) Introducing the student to special equipment for structural and optical examinations of solid materials.

B - The skills objectives of the course.

- 1) Giving students the skill of using mathematical equations.
- 2) Providing the student with the skill of using laboratory equipment for measuring the physical properties of solids.
- 3) Giving the student the skill of preparing and writing scientific reports on the experiments he performs in the laboratory.

Teaching and learning methods

- 1) Giving lectures and solving mathematical problems on the blackboard.
- 2) Using modern technologies and electronic presentation tools (Data Show) to illustrate shapes, drawings, and diagrams.
- 3) Divide students into small groups for laboratory work.
- 4) Use the role-exchange method in the practical laboratory.
- 5) Focus on students' participation in the lecture by asking questions and devising new ideas.
- 6) Assigning the student to prepare scientific reports on laboratory experiments.
- 7) Adopting the homework method for students to solve exercises while evaluating their solutions in the classroom.

Evaluation methods

- 1) Monthly tests.
- 2) Rapid daily tests.
- 3) Oral questions, class contributions.
- 4) Evaluation of scientific reports.
- 5) Practical tests.

C- Emotional and value goals

- 1) Enhancing the ability to deduce and logically analyze scientific issues.
- 2) Consolidating the spirit of joint scientific work and enhancing students' confidence in their abilities by involving students in practical laboratory groups.
- 3) Developing precision and caution in dealing with laboratory equipment.
- 4) Developing the spirit of scientific research in the student.

Teaching and learning methods

- 1) The interactive method of presenting the study material.**
- 2) Involving students in deriving scientific ideas and solving mathematical exercises.**
- 3) A practical explanation of the device used, how to use it, and how to perform the measurement required in the experiment.**
- 4) Assigning students to prepare scientific research and reports.**

Evaluation methods

- 1) Testing students directly and orally.**
- 2) Daily surprise written tests.**
- 3) Scheduled tests.**
- 4) Conducting a method of exchanging roles between the teacher and the student in the scientific laboratory and evaluating him on his performance.**

D - General and qualifying transferable skills (other skills related to competency Employment and personal development).

- 1) The ability to analyse, deduce and describe.**
- 2) The ability to understand and comprehend solid materials and study their physical properties.**
- 3) The ability to work in research laboratories.**
- 4) The ability to conduct scientific research.**

11.Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Oral exam with written test exams	Lecture	- Introduction - Phonons and lattice - Inelastic scattering of phonon		2	1
Oral exam with written test exams	Lecture	- Group velocity - The structure properties - Optical properties in infrared		2	2
Oral exam with written test exams	Lecture	- Thermal properties (heat capacity) - Thermal conductivity - Thermal resistivity		2	3
Oral exam with written test exams	Lecture	- Free electron model-lorentz model - Hall effect		2	4
Short questions in addition to assignments	Lecture	- Fermi-Dirac statistics - Plasmon Electrical conductivity		2	5
Oral exam with written test exams	Lecture	Effective mass-fermi surface constriction Semiconductors (intrinsic and extrinsic) Mobility and electrical Conductivity		2	6
Attendance test (various questions)		Semester Exam			7
Oral exam with written	Lecture	- Crystal defects and dislocation		2	8

test exams		- Point, lines defects. - surface, Volume defects			
Oral exam with written test exams	Lecture	- Superconductors - Uses of superconductors		2	9
Oral exam with written test exams	Lecture	- Magnetic properties - Dia-magnetic materials		2	10
Oral exam with written test exams	Lecture	- Para-magnetic materials - Experimental diffraction methods		2	11
Oral exam with written test exams	Lecture	Ferromagnetic materials		2	12
Oral exam with written test exams	Lecture	Semiconductors		2	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review		2	15

44. Infrastructure	
<p>4. 1- Solid State Physics / Dr. Moaheed Gabriel.</p> <p>5. 2- Electrical and magnetic properties / Dr. Wakaa Al-Jubouri and Dr. Fahd Ghalib.</p> <p>6. Solid state physics / Dr. Yahya Nouri Al-Jamal/University of Mosul</p>	<p>Required readings :</p> <p>7. Course Books</p> <p>8. Other</p>
<ul style="list-style-type: none"> • PowerPoint 	Special Requirements

Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)
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45. Acceptance	
Radioactive Waste Disposal	Prerequisites
Theoretical: 30 students	Minimum number of students
Theoretical: 50 students Practical	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

Ministry of Higher Education and Scientific Research / Anbar University	46. Educational institution
College of Education for Pure Sciences / Department of Physics	47. University Department / Center
English	48. Course Name/Code
Bachelor / First Level	49. Programs in which it enters
Presence	50. Available Attendance Forms
First Semester / 2022-2023	51. Semester / Year
2 hours per week * 15 weeks = 30 hours / semester	52. Number of Credit Hours (Total)
2022/2/10	53. The history of preparation of this description
54. Course Objectives:	
(k) Improvement the level of students in the English language and training them to practice in their academic and learn the basic rules of this international language and using it in all fields.	
(l) Learn how to select (simplified) reading material suitable for their level and read on their own.	
(m) Understand and use tenses like the simple present, the present progressive, the simple past, and the past progressive.	
(n) Read examples of different types of readings, including articles, short stories, fact sheets, timetables, instructions, directions, requests, descriptions and conversations.	
(o) be self-reliant in acquiring new vocabulary,	
(p) improve their understanding of new vocabulary related to the reading and develop critical	

thinking skills.

55. Learning outcomes and methods of teaching, learning and evaluation

P. Knowledge and understanding

3. develop their skills of listening for gist and specific information
4. develop their knowledge of vocabulary on a wide range of topics
5. develop their understanding of colloquial English.
6. develop their spoken English.

Q. Subject-specific skills

1. -look up words in their dictionaries.
2. -learn how to select (simplified) reading material suitable for their level and read on.
3. communicate using the new vocabulary words they learned, and recognize vocabulary words into their own language.

• Teaching and learning methods

- Lecture, discussion, short reports, problem solving

• Evaluation methods

- Monthly test (essay and topical)
- Activity
- Short questions
- Reports
- Duties
- Final Exam

R. Thinking skills

- Ask various questions and brainstorm

• Teaching and learning methods

- Discussion, lecture, questioning

• Evaluation methods

9. Achievement Tests
10. Test methods (interview and observation)
11. Student feedback

S. General and transferable Skills (other skills related to employability and personal development).

6. Verbal teaching behavior skills such as discussion, dialogue, explanation and interpretation.
7. Non-verbal teaching behavior skills, such as visual contact between the teacher and the student, and use of illustrations such as educational videos and pictures
8. Planning skill: such as the skill of determining the subject of the lesson, using appropriate means, preparing questions
9. Implementation skills: such as stimulating students' motivation, controlling and managing the classroom
10. Evaluation skills: such as preparing monthly tests, essays, objective

56. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Short questions with homework solving	Lecture + desiccation	Introduction, Present, past, future tenses - Examples of solved	knowledge and understanding	2	1
Short questions with homework solving	Lecture + desiccation	Passive and active, vocabulary	knowledge and understanding	2	2
Short questions with homework solving	Lecture + desiccation	Academic writing , Reading, vocabulary	knowledge and understanding	2	3
Short questions with homework solving	Lecture + desiccation	Grammar	knowledge and understanding	2	4
Short questions in addition to assignments	Lecture + desiccation	Reading Comprehension	knowledge and understanding	2	5
Short questions	Lecture + desiccation	Academic Reading , vocabulary,	knowledge and understanding	2	6
Attendance test (various questions)		Semester Exam			7
Short questions	Lecture + desiccation	Reading Comprehension	knowledge and understanding	2	8
Short Questions + Assignmen	Lecture + desiccation	Grammar	knowledge and understanding	2	9

ts					
Short questions	Lecture + desiccation	Academic Reading , vocabulary,	knowledge and understanding	2	10
Short questions	Lecture + desiccation	Reading Comprehension	knowledge and understanding	2	11
Short questions	Lecture + desiccation	Academic Reading , vocabulary,	knowledge and understanding	2	12
Short questions	Lecture + desiccation	Academic Reading , vocabulary,	knowledge and understanding	2	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review	*The student's understanding of the material tucked during the semester * The student's knowledge to link all of the above		15

57. Infrastructure	
1. New Headway English Course – Workbook upper intermediate (by: Liz & John Soars) 2. New Headway English Course – Student Book upper intermediate (by: Liz & John Soars)	Required readings : 9. Course Books 10. Other
PowerPoint	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)

58. Acceptance	
Electrical & Magnetic	Prerequisites
Theoretical: 30 students	Minimum number of students
Theoretical: 50 students	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

Ministry of Higher Education and Scientific Research / Anbar University	59. Educational institution
College of Education for Pure Sciences / Department of Physics	60. University Department / Center
Atomic physics	61. Course Name/Code
Bachelor / Level 3	62. Programs in which it enters
Presence	63. Available Attendance Forms
First Semester / 2022-2023	64. Semester / Year
3 hours theoretical + 3 hours practical / week * 15 weeks = 90 hours / semester	65. Number of Credit Hours (Total)
19-9--2022	66. The date of preparation of this description
67. Course Objectives:	
(q) The student knows atomic models	
(r) The student knows what x-rays are and how to obtain them	
(s) The student learns about the ways radiation interacts with matter	
(t)	

68. Learning outcomes and methods of teaching, learning and evaluation

<p style="text-align: right;">A- Knowledge and understanding The student understands atomic structure The student understands atomic models The student learns the ways radiation interacts with matter</p> <p>For the student to understand what x-rays are and how to obtain them</p>					
<p style="text-align: right;">B- Subject-specific skills</p> <p>1- The student concludes that the atom and atomic structure are of great importance in industry and technology 2- The student distinguishes between the different effects between matter and radiation 3- The student learns the dangers of atomic radiation and the dangers of the atom</p>					
<p style="text-align: center;">• Teaching and learning methods</p>					
<p>Through daily and monthly exams, as well as the student's classroom activity and interaction with the lesson material</p>					
<p style="text-align: center;">• Evaluation methods</p>					
<p>- Monthly test (essay and topical) -Activity -Short questions -Reports -Duties -Final Exam</p>					
<p>T. Thinking skills</p>					
<p>1- The student knows how to measure X-ray energy and how to use and generate it 2- This science should be used in technological development and industry</p>					
<p>U. General and transferable Skills (other skills related to employability and personal development).</p>					
<p>11. D - General and transferable skills (other skills related to employability and personal development). 12. The student knows how to measure X-ray energy and how to use and generate it 13. This science should be used in technological development and innovation</p>					

69. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
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Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Theory of Relativity	Introducing the student to the theory of relativity and its importance	3 theoretical 3 Practical	1
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Black body radiation	Introducing the student to black body radiation and its meaning	3 theoretical 3 Practical	2
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	The effect of radiation on matter	Familiarizing the student with the effect of radiation on matter	3 theoretical 3 Practical	3
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Atomic models	atomic models	3 theoretical 3 Practical	4
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Total energy according to the Bohr model	Calculating total energy according to the Bohr model	3 theoretical 3 Practical	5
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	X-Ray	Identifying the student with x-rays	3 theoretical 3 Practical	6
---		Semester Exam			7
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Energy levels of x-rays	Calculating the energy levels of X-rays	3 theoretical 3 Practical	8
Daily exam,	Lecture + Lab	A X-ray diffraction	Familiarizing the student with X-ray	3 theoretical 3 Practical	9

discussion, assignments, and monthly exams			diffraction and how it is done		
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Wave and particle theory	Learn about wave and particle theory	3 theoretical 3 Practical	10
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Negr's fugue equation	What is Nagger's fugue equation?	3 theoretical 3 Practical	11
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Applications to Nagger's fugue equation	Applications to Nagger's fugue equation	3 theoretical 3 Practical	12
Daily exam, discussion, assignments, and monthly exams	Lecture + Lab	Electronic structure of the atom	Familiarizing the student with the electronic structure of the atom	3 theoretical 3 Practical	13
Daily exam, discussion, assignments, and monthly exams		Orbital angular momentum	Calculating orbital angular momentum		14
		Semester Exam			15

70. References	
7. Atomic physics book, Dr. Taleeb Alafay, university of Musool, 1985. 8. Molecular physics book, Dr. Khalid A. Jasem, university of Musool, 1992.	Required readings : 11. Course Books 12. Other
PowerPoint	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)
71. Acceptance	
	Prerequisites
Theoretical: 30 students Practical: 20 students	Minimum number of students
Theoretical: 50 students Practical: 20 students	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

Ministry of Higher Education and Scientific Research / Anbar University	72. Educational institution
College of Education for Pure Sciences / Department of Physics	73. University Department / Center
Email/ Presence	74. Course Name/Code
Bachelor / First Level	75. Programs in which it enters
Presence	76. Available Attendance Forms
First Semester / 2022-2023	77. Semester / Year
3 hours theoretical + 3 hours practical / week * 15 weeks = 90 hours / semester	78. Number of Credit Hours (Total)
2022/2/10	79. The history of preparation of this description
80. Course Objectives:	
(u) The student knows the classification of materials in terms of their electrical properties: conductive, dielectric and semiconductor	
(v) The student gets to know the scientific basis in the work and manufacture of semiconductor materials	
(w) The student gets to know the factors affecting the determination of the basic properties of semiconductor materials	
(x) The student gets to know the factors affecting the determination of any practical application based on semiconductor materials	

81. Learning outcomes and methods of teaching, learning and evaluation

V. Knowledge and understanding

7. -The student understands each type of semiconductor material
8. -The student understands the importance of semiconductor materials
9. -The student learns to use semiconductor materials in electronic applications
10. -The student understands the relationship of semiconductor materials to other electronic elements.

W. Subject-specific skills

4. -The student concludes that there is a physical basis upon which the work of any electronic element is based
5. -The student should distinguish between any element of electronic circuits
6. -The student learns to classify electronic elements based on their importance and practical application

• Teaching and learning methods

- Lecture, discussion, short reports, problem solving

• Evaluation methods

- Monthly test (essay and topical)
- Activity
- Short questions
- Reports
- Duties
- Final Exam

X. Thinking skills

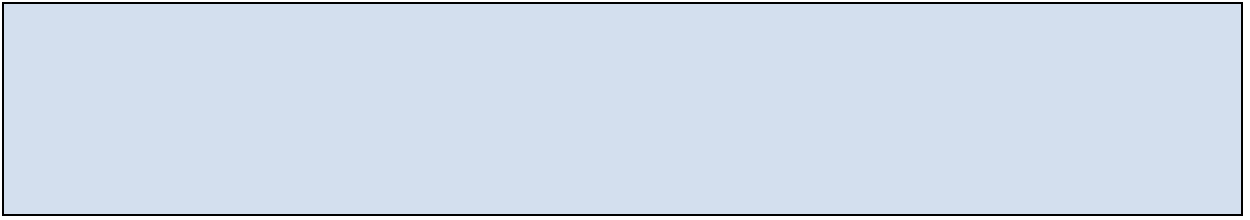
- Ask various questions and brainstorm

• Teaching and learning methods

- Discussion, lecture, questioning

• Evaluation methods

12. Achievement Tests
13. Test methods (interview and observation)
14. Student feedback



82. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Short questions with homework solving	Lecture + Lab	Chapter 1 / 1- Electrical circuit 2- Voltage 3- Electric current 4- Resistors 5- Reading electrical resistors 6- Kirchhoff's law of voltage and current 7- Examples of solved	* Knowledge of non-political concepts in electricity and electronics	3 theoretical 3 Practical	1
Short questions with homework solving	Lecture + Lab	Chapter II/1- Introduction 2- Energy beams of crystals 3- Conductive, insulating and semiconductor materials 4- Pure semiconductors 5- Impurity semiconductors	*Knowledge of the basics of semiconductor physics	3 theoretical 3 Practical	2
Short questions	Lecture + Lab	-6Negative semiconductors 7- Positive semiconductors 8- Charge density in impurity conductors 9- Current flow in impurity semiconductors 10- Solving the exercises of the second semester	*Knowledge of the basics of semiconductor physics	3 theoretical 3 Practical	3
اسئلة قصيرة	Lecture + Lab	Chapter III / Crystalline Biode 1- Introduction 2- PN junction PN 3- Drain Zone	*Know the basics of the work of the crystalline diode	3 theoretical 3 Practical	4
Short questions in addition to assignments	Lecture + Lab	-4Barrier voltage 5- PN junction at rest 6- PN junction power diagram 7- Calculation of barrier voltage 8- PN junction under external influence 9- Front bias	*Know the basics of the work of the crystalline diode	3 theoretical 3 Practical	5

		of PN junction -10 Reverse PN junction bias			
Short questions	Lecture + Lab	11. Binary Circuit Analysis 12- Bi-Zener 13- Tunneling Duo 14. Solving Chapter Three Problems	*Know the basics of the work of the crystalline diode	3 theoretical 3 Practical	6
Attendance test (various questions)		Semester Exam			7
Short questions	Lecture + Lab	Chapter IV / Uses of the crystalline diode 1- Introduction 2- Calendar 3- Half-wave calendar circuit	*Know the uses of the work of the crystalline diode	3 theoretical 3 Practical	8
Short Questions + Assignments	Lecture + Lab	4- Full wave rectifier circuit 5- Calendar bridge 6- Ripple factor 7- Filtration circuits 8- Binding circuits	* Know the uses of the work of the crystalline diode	3 theoretical 3 Practical	9
Short questions	Lecture + Lab	9- Voltage multiplier circuit 10. Cutting circuits (pruning) 11. Voltage regulation 12. Solving Chapter IV problems	*Know the uses of the work of the crystalline diode	3 theoretical 3 Practical	10
Short questions	Lecture + Lab	Chapter V: Transistor 1- Introduction 2- Basic Characteristics of the Transistor	*Know the basics of the transistor	3 theoretical 3 Practical	11
Short questions	Lecture + Lab	-3The principle of operation of the transistor 4- Methods of connecting the transistor 5- Connecting the common base 6- Connecting the common emitter 7- Connecting the common collector 8- Solved examples	*Know the basics of the transistor work and ways to connect the transistor	3 theoretical 3 Practical	12
Short questions	Lecture + Lab	-7Transistor Action Zones 8- Active Zone 9- Cutting Area 10 Saturation Zone 11- 11- Solving Fifth Chapter	*Know the areas where the transistor works	3 theoretical 3 Practical	13

		Exercises			
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review	*The student's understanding of the material tucked during the semester * The student's knowledge to link all of the above		15

83. Infrastructure	
9. Physics of Electrons, Dr. Subhi Saeed Al-Rawi 10. The basis of electronic engineering - Dr. Riyadh Kamal Al-Hakim 11. Rakesh Kumar Garg by Basic Electronics 12. Electronic devices electron flow version by Thomas L. Floyd	Required readings : 13. Course Books 14. Other
<ul style="list-style-type: none"> • PowerPoint 	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)

84. Acceptance	
Electrical & Magnetic	Prerequisites
Theoretical: 30 students Practical: 20 students	Minimum number of students
Theoretical: 50 students Practical: 20 students	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

Ministry of Higher Education and Scientific Research / Anbar University	85. Educational institution
College of Education for Pure Sciences / Department of Physics	86. University Department / Center
Electromagnetic	87. Course Name/Code
Bachelor / First Level	88. Programs in which it enters
Presence	89. Available Attendance Forms
First Semester / 2022-2023	90. Semester / Year
3 hours theoretical / week * 15 weeks = 45 hours / semester	91. Number of Credit Hours (Total)
2022/2/10	92. The history of preparation of this description
93. Course Objectives:	
(y) The student knows the rules basic in electromagnetic.	
(z) The student gets to know the scientific basis in the Electrostatic and Application of Gauss 's law.	
(aa) The student gets to know the tangential component of E, Piosson 's and Laplace 's equations, application of Piosson 's and Laplace 's equations, solved examples, problem.	
(bb) The student gets to know Time-varying electromagnetic fields.	

94. Learning outcomes and methods of teaching, learning and evaluation

Y. Knowledge and understanding

11. -The student gets to know the factors affecting the determination of the basic properties of the electric dipole, materials in an electric field.
12. -Faraday 's law of induction , Maxwell 's equation from Faraday 's law
13. -Maxwell 's equation from Ampere 's law , Maxwell 's equation from Gauss 's law , Maxwell 's equation and boundary conditions.
14. -The student understands the Electromagnetic waves.

Z. Subject-specific skills

7. -The student concludes that there is a physical basis upon which the work of any electromagnetic element is based.
8. -The student should distinguish between any element of electronic circuits
9. -The student learns Coulomb's law , electric field intensity, electric field intensity due to charge distribution, electric flux and electric flux density.

• Teaching and learning methods

- Lecture, discussion, short reports, problem solving

• Evaluation methods

- Monthly test (essay and topical)
- Activity
- Short questions
- Reports
- Duties
- Final Exam

AA. Thinking skills

- Ask various questions and brainstorm

• Teaching and learning methods

- Discussion, lecture, questioning

• Evaluation methods

15. Achievement Tests
16. Test methods (interview and observation)
17. Student feedback

BB. General and transferable Skills (other skills related to employability and personal development).

14. Verbal teaching behavior skills such as discussion, dialogue, explanation and interpretation.
15. Non-verbal teaching behavior skills, such as visual contact between the teacher and the student, and use of illustrations such as educational videos and pictures
16. Planning skill: such as the skill of determining the subject of the lesson, using appropriate means, preparing questions
17. Implementation skills: such as stimulating students' motivation, controlling and managing the classroom
18. Evaluation skills: such as preparing monthly tests, essays, objective

95. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Short questions with homework solving	Lecture + desiccation	Chapter 1 / 1- vector analysis 2- Examples of solved	knowledge and understanding	3 theoretical	1
Short questions with homework solving	Lecture + desiccation	Chapter II/ Coordinate systems	knowledge and understanding	3 theoretical	2
Short questions with homework solving	Lecture + desiccation	Electrostatic - Solving the exercises of the second semester	knowledge and understanding	3 theoretical	3
Short questions with homework solving	Lecture + desiccation	Chapter III / Electric field and Gauss's law	knowledge and understanding	3 theoretical	4
Short questions in addition to assignment	Lecture + desiccation	Solution of Electrostatic Problem	knowledge and understanding	3 theoretical	5
Short questions	Lecture + desiccation	The Electrostatic Field in Dielectric Media Solving Chapter Three Problems	knowledge and understanding	3 theoretical	6
Attendance test (various questions)		Semester Exam			7
Short questions	Lecture + desiccation	Chapter IV / Electric susceptibility and dielectric constant	knowledge and understanding	3 theoretical	8
Short Questions +	Lecture + desiccation	boundary conditions of the field vectors	knowledge and understanding	3 theoretical	9

Assignments					
Short questions	Lecture + desiccation	Electrostatic Energy Solving Chapter IV problems	knowledge and understanding	3 theoretical	10
Short questions	Lecture + desiccation	Chapter V The Magnetism, The Magnetization Equations of Field,	knowledge and understanding	3 theoretical	11
Short questions	Lecture + desiccation	Magnetic properties of matters, Magnetic Flux Solved examples	knowledge and understanding	3 theoretical	12
Short questions	Lecture + desiccation	Magnetic Susceptibility and magnetic Permeability Solving Fifth Chapter Exercises	knowledge and understanding	3 theoretical	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review	*The student's understanding of the material tucked during the semester * The student's knowledge to link all of the above		15

96. Infrastructure	
13.Foundation Of Electromagnetic Theory By: John R. Reitz, Frederick J. Milford & Robert W. Christy	Required readings : 15. Course Books 16. Other
PowerPoint	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)

97. Acceptance	
Electrical & Magnetic	Prerequisites
Theoretical: 30 students	Minimum number of students
Theoretical: 50 students	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

Ministry of Higher Education and Scientific Research / Anbar University	98. Educational institution
College of Education for Pure Sciences / Department of Physics	99. University Department / Center
Physical Optics	100. Course Name/Code
Bachelor / second Level	101. Programs in which it enters
Presence	102. Available Attendance Forms
first Semester / 2022-2023	103. Semester / Year
3 hours theoretical +3 practical/ week * 15 weeks = 90 hours / semester	104. Number of Credit Hours (Total)
2022/9/20	105. The history of preparation of this description
106. Course Objectives:	
(cc) The student will understand the basics of physical optics	
(dd) - Introduce the student to the phenomenon of light interference, how it occurs and its applications.	
(ee) Introduce the student to the phenomenon of light diffraction, how it occurs and its applications.	
(ff) Introduce the student to the phenomenon of polarization of light, how it occurs and its applications.	

107. Learning outcomes and methods of teaching, learning and evaluation

CC. Knowledge and understanding

1- The student's understanding of the basics of physical optics. 2- Introducing the student to the phenomenon of light interference, how it occurs and its applications. 3- Introducing the student to the phenomenon of light diffraction, how it occurs and its applications. 4- Introducing the student to the phenomenon of polarization of light, how it occurs and its applications

DD. Subject-specific skills

• Teaching and learning methods

- Lecture, discussion, short reports, problem solving

• Evaluation methods

- Monthly test (essay and topical)
-Activity
-Short questions
-Reports
-Duties
-Final Exam

EE. Thinking skills

- Ask various questions and brainstorm

• Teaching and learning methods

- Discussion, lecture, questioning

• Evaluation methods

18. Achievement Tests
19. Test methods (interview and observation)
20. Student feedback

FF. General and transferable Skills (other skills related to employability and personal development).

19. Verbal teaching behavior skills such as discussion, dialogue, explanation and interpretation.
20. Non-verbal teaching behavior skills, such as visual contact between the teacher and the student, and use of illustrations such as educational videos and pictures

21. Planning skill: such as the skill of determining the subject of the lesson, using appropriate means, preparing questions
22. Implementation skills: such as stimulating students' motivation, controlling and managing the classroom
23. Evaluation skills: such as preparing monthly tests, essays, objective

108. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Short questions with homework solving	Lecture	Huygen's principle, Young's experiment, interference fringes from a double source		3 theoretical 3 Practical	1
Short questions with homework solving	Lecture	intensity distribution in the fringe system, Fresnel's Biprism, other apparatus depending on division of the wave front, coherent sources, division of amplitude ,Michelson interferometer, circular fringes, visibility of fringes		3 theoretical	2
Short questions	Lecture	interferometer measurements of length, Twyman and Green interferometer ,index of refraction by interference methods, reflection from a plane-parallel film, fringes of equal inclination, Newton's rings, problems.		3 Practical	3
اسئلة قصيرة	Lecture	Fresnel and Fraunhofer diffraction, diffraction by a single slit, further investigations of single-slit pattern,		3 theoretical	4
Short questions in addition to assignments	Lecture	rectangular aperture, resolving power with a rectangular aperture,		3 Practical	5
Short questions	Lecture	chromatic resolving power of a prism, circular aperture,		3 theoretical	6

		resolving power of a telescopen			
Attendance test (various questions)		resolving power of a microscope, the double slit, qualitative aspects of the patter		3 Practical	7
Short questions	Lecture	derivation of the equation for the intensity, comparison of the single-slit and double –slit pattern		3 theoretical	8
Short Questions + Assignments	Lecture + Lab	distinction between interference and diffraction, problems.		3 Practical	9
Short questions	Lecture + Lab	POLARIZATION		3 theoretical	10
Short questions	Lecture + Lab	Polarization by reflection		3 Practical	11
Short questions	Lecture + Lab	representation of the vibrations in light, polarization angle and Brewster's law		3 theoretical	12
Short questions	Lecture + Lab	Huygen's principle, Young's experiment, interference fringes from a double source		3 Practical	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review			15

109. Infrastructure	
1 - Fundamentals of optics Edited by(Francis A. Jenkins & Harvey E. White) 2-Principles of optics ,by MAX BORN Cambridge University Press, April 2013	Required readings : 17. Course Books 18. Other
<ul style="list-style-type: none"> • PowerPoint 	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)
110. Acceptance	
	Prerequisites
	Minimum number of students
	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

Ministry of Higher Education and Scientific Research / Anbar University	111. Educational institution
College of Education for Pure Sciences / Department of Physics	112. University Department / Center
Geometrical Optics	113. Course Name/Code
Bachelor / first Level	114. Programs in which it enters
Presence	115. Available Attendance Forms
second Semester / 2022-2023	116. Semester / Year
3 hours theoretical +3 practical/ week * 15 weeks = 90 hours / semester	117. Number of Credit Hours (Total)
2022/9/20	118. The history of preparation of this description
119. Course Objectives:	
The student should know the foundations of geometric optics	
(gg)	
(hh) The student should know how light propagates, reflects, and refracts	
(ii) The student should know how images are formed in lenses and mirrors	
(jj) The student knows the types of optical devices and how they work	

120. Learning outcomes and methods of teaching, learning and evaluation

GG. Knowledge and understanding

- 1-The student understands how light is transmitted, reflected, and refracted
- 2-The student will know how images are formed in lenses and mirrors

HH. Subject-specific skills**• Teaching and learning methods**

- Lecture, discussion, short reports, problem solving

• Evaluation methods

- Monthly test (essay and topical)
- Activity
- Short questions
- Reports
- Duties
- Final Exam

II. Thinking skills

- Ask various questions and brainstorm

• Teaching and learning methods

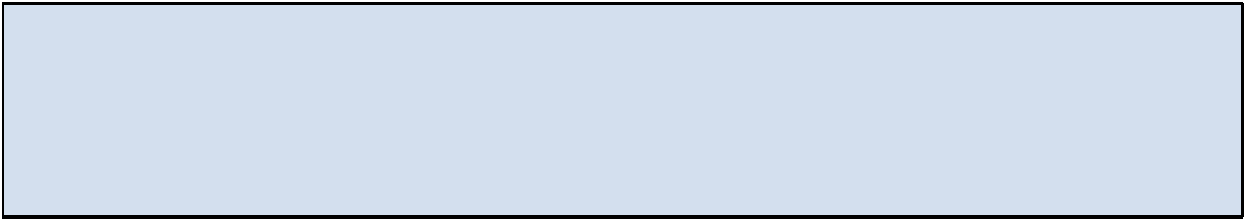
- Discussion, lecture, questioning

• Evaluation methods

21. Achievement Tests
22. Test methods (interview and observation)
23. Student feedback

JJ. General and transferable Skills (other skills related to employability and personal development).

24. Verbal teaching behavior skills such as discussion, dialogue, explanation and interpretation.
25. Non-verbal teaching behavior skills, such as visual contact between the teacher and the student, and use of illustrations such as educational videos and pictures
26. Planning skill: such as the skill of determining the subject of the lesson, using appropriate means, preparing questions
27. Implementation skills: such as stimulating students' motivation, controlling and managing the classroom
28. Evaluation skills: such as preparing monthly tests, essays, objective



121. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Short questions with homework solving	Lecture	Propagation of light		3 theoretical 3 Practical	1
Short questions with homework solving	Lecture	Spherical surfaces		3 theoretical	2
Short questions	Lecture	Gaussian formula		3 Practical	3
اسئلة قصيرة	Lecture	Thin lenses		3 theoretical	4
Short questions in addition to assignments	Lecture	Lens makers formula		3 Practical	5
Short questions	Lecture	Image formation using thin lenses		3 theoretical	6
Attendance test (various questions)		Combination of lenses		3 Practical	7
Short questions	Lecture	Thick lenses		3 theoretical	8
Short Questions + Assignments	Lecture + Lab	Spherical mirrors		3 Practical	9
Short questions	Lecture + Lab	IMAGE FORMATION IN SPHERICAL		3 theoretical	10

		MIRRORS			
Short questions	Lecture + Lab	Mirror formula		3 Practical	11
Short questions	Lecture + Lab	aberrations		3 theoretical	12
Short questions	Lecture + Lab	Optical instruments		3 Practical	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review			15

122. Infrastructure	
1 - Fundamentals of optics Edited by(Francis A. Jenkins & Harvey E. White) 2-Principles of optics ,by MAX BORN Cambridge University Press, April 2013	Required readings : 19. Course Books 20. Other
<ul style="list-style-type: none"> • PowerPoint 	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)
123. Acceptance	
	Prerequisites
	Minimum number of students
	The largest number of students

Course Description Form

Review the performance of higher education institutions (Academic Program Review)

This course description provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the student to achieve.

Proving whether he has made the most of the available learning opportunities. It must be linked to the description of program.

Ministry of Higher Education and Scientific Research / Anbar University	124. Educational institution
College of Education for Pure Sciences / Department of Physics	125. University Department / Center
Laser physics	126. Course Name/Code
Bachelor / fourth Level	127. Programs in which it enters
Presence	128. Available Attendance Forms
second Semester / 2022-2023	129. Semester / Year
2 hours theoretical / week * 15 weeks = 30 hours / semester	130. Number of Credit Hours (Total)
2022/9/20	131. The history of preparation of this description
132. Course Objectives:	
(kk) To make the student understand the idea of lasers	
(ll) Introduce the student to the foundations of laser generation	
(mm) Introduce the student to the optical resonator, its purpose and types	
(nn) Introduce the student to the pumping methods and pumping plans used in laser devices	
(oo) Introduce the student to the types of lasers and power plans	
(pp) Introducing the student to laser output and the techniques used in it	
(qq) - Introducing the student to the properties of lasers	

(rr) Introducing the student to the applications of laser rays in various fields..

133. Learning outcomes and methods of teaching, learning and evaluation

KK. Knowledge and understanding

1-Introducing the student to the idea of lasers. 2- Introducing the student to the foundations of laser generation. 3- Introducing the student to the optical resonator, its purpose and types. 4- Introducing the student to the pumping methods and pumping plans used in laser devices.. 5- Introducing the student to the types of lasers and their diagrams. The energy in it. 6- Introducing the student to the laser output and the techniques used in it. 7- Introducing the student to the properties of lasers. 8- Introducing the student to the applications of laser rays in various fields.

LL. Subject-specific skills

- **Teaching and learning methods**

- Lecture, discussion, short reports, problem solving

- **Evaluation methods**

- Monthly test (essay and topical)
-Activity
-Short questions
-Reports
-Duties
-Final Exam

MM. Thinking skills

- Ask various questions and brainstorm

- **Teaching and learning methods**

- Discussion, lecture, questioning

- **Evaluation methods**

24. Achievement Tests
25. Test methods (interview and observation)
26. Student feedback

NN. General and transferable Skills (other skills related to employability and personal development).

29. Verbal teaching behavior skills such as discussion, dialogue, explanation and interpretation.
30. Non-verbal teaching behavior skills, such as visual contact between the teacher and the student, and use of illustrations such as educational videos and pictures
31. Planning skill: such as the skill of determining the subject of the lesson, using appropriate means, preparing questions
32. Implementation skills: such as stimulating students' motivation, controlling and managing the classroom
33. Evaluation skills: such as preparing monthly tests, essays, objective

134. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
Short questions with homework solving	Lecture	Laser and maser idea		2 theoretical	1
Short questions with homework solving	Lecture	Differences between laser and maser		2 theoretical	2
Short questions	Lecture	Interaction between laser light and the material		2 theoretical	3
اسئلة قصيرة	Lecture	Enstien's coeffiecients		2 theoretical	4
Short questions in addition to assignments	Lecture	Population at thermal equilibrium		2 theoretical	5
Short questions	Lecture	Principles of laser production		2 theoretical	6
Attendance test (various questions)		Plans of pumping		2 theoretical	7
Short questions	Lecture	Methods of pumping		2 theoretical	8
Short Questions + Assignments	Lecture + Lab	Resonator definition and operation		2 theoretical	9
Short questions	Lecture + Lab	Laser resonator stability		2 theoretical	10

Short questions	Lecture + Lab	Resonator design		2 theoretical	11
Short questions	Lecture + Lab	Laser output		2 theoretical	12
Short questions	Lecture + Lab	Laser types		2 theoretical	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review			15

135. Infrastructure	
<p>1-Laser physics and some practical applications,” Siham Afif Qandala. Publishing House General Cultural Affairs Publication year 1992</p> <p>-2Laser and its applications The author is Farouk bin Abdullah Al- Watban Publisher: Mars Publishing House, 1987</p>	<p>Required readings :</p> <p>21. Course Books</p> <p>22. Other</p>
<ul style="list-style-type: none"> • PowerPoint 	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)
136. Acceptance	
	Prerequisites
	Minimum number of students
	The largest number of students