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 : 10/6/2021

Prof. Dr. Abdul Rahman Salman. Juma	Assist. Prof.Dr. Harith Kamil Buniya	Prof. Dr. Ali Kalaf Aobaid
Dean's Name	Dean's Assistant For Scientific Affairs	Head of Department
Date: 26/6/2021	Date : 15/ 6 /2021	Date : 14/ 6/2021
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Date: 14/ 6/2021
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	10/6/2021

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 acuired 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. Programme 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 programme
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

				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
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				√								√				√

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
Third	PHE321	Atomic physics	Core	√	√				√			√					√		
	PHE322	Molecular physics	Core	√	√				√			√					√		
	PHE323	Electronics	Core	√	√				√			√					√		
	PHE324	Electronic circuit	Core	√	√				√			√					√		
	PHE325	Quantum mechanics 1	Core	√	√				√			√					√		
	PHE326	Analytical mechanics	Core	√	√				√			√					√		
	PHE327	Complex function	Core	√	√				√			√					√		
	PHE328	Statistical mechanic	Core	√	√				√			√					√		
	PHE329	New and renew energy	Option	√	√				√			√					√		
	PHE330	Crystals	Option	√	√				√			√					√		
	PHE331	Sets theory	Option	√	√				√			√					√		
	EPS 311	Curricula and Methodology	Core		√	√		√	√			√	√		√	√	√	√	
	EPS 312	Educational Counselling and Psychological Health	Core			√		√	√			√	√		√	√	√		
	UOA340	English language 3	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
Fourth	PHE421	Solid state physics 1	Core	√	√				√			√					√		
	PHE422	Solid state physics 2	Core	√	√				√			√					√		
	PHE423	Quantum mechanics 2	Core	√	√				√			√					√		
	PHE424	Nuclear physics	Core	√	√				√			√					√		
	PHE425	Radiation physics	Core	√	√				√			√					√		
	PHE426	Electromagnetic	Core	√	√				√			√					√		
	PHE427	Electrodynamics	Core	√	√				√			√					√		
	PHE428	Laser physics 1	Core	√	√				√			√					√		
	PHE429	Classroom Observation	Core	√	√				√		√	√					√		
	PHE430	Nanotechnology	Option	√	√				√			√			√		√		
	EPS411	Measurement and Evaluation	Core		√	√	√		√			√				√	√	√	√
	EPS412	Teaching Practicum	Core		√	√	√	√	√			√	√		√	√	√	√	√
	EPS413	Classroom Observation	Core		√	√	√	√	√			√	√		√	√	√	√	√
	EPS414	Graduation Research Project	Core	√			√	√	√	√			√		√				√
	UOA440	English language 4	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 / 2020-2021	**6. Semester / Year**
2hours	**7. Number of Credit Hours (Total)**
1March. 2021	**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	

11. Course Structure					
Evaluation method	**Method of education**	**Name of the unit/course or topic**	**Required Learning Outcomes**	**Hours**	**The week**
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		2	5

		condition and orthonormal condition of wave functions.			
		Test 1		2	6
Short questions	Lecture	Normalized functions Eigenvalues Eigenfunctions Expected Value		2	7
Short questions	Lecture	Eigenfucntions 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	
Principles of Quantum Mechanics , by Salim AlSHamaya , University of Mosul , 1988. **Quantum Mechanics by L. I. Schif** **Quantum Mechanics by S. Allayani , KSA.**	Required readings : 1. Course Books 2. Other
• 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 / 2020-2021	**19. Semester / Year**
3 hours theoretical + 3 hours practical / week * 15 weeks = 90 hours / semester	**20. Number of Credit Hours (Total)**
22-6-2021	**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
5. Test methods (interview and observation)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	*Thestudent'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

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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	**2020-2021**
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 deviation**

28. Learning outcomes and methods of teaching, learning and evaluation
I. Knowledge and understanding **. The student should know the basic laws in statistics1 .** **The student should learn how to describe the motion of the number of particles .2** **The student should distinguish between events and statistical variables .3**
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.
L. General and transferable Skills (other skills related to employability and personal development). - Give Issues and try to find solutions to them through the application of physical equations and rules in statistical mechanics.

2. Course Structure					
The week	**Hours**	**Required Learning Outcomes**	**Name of the unit/course or topic**	**Method of education**	**Evaluation method**
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	
:**Required readings** .**Course Books** .**Other**	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 / 2020-2021	**36. Semester / Year**
2hours	**37. Number of Credit Hours (Total)**
1Sept. **2021**	**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

M. 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,

N. 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

O. **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

P. 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		2	6

		Force and Hydrogen atom.			
Short questions	Lecture	Probability Density of single electron atom and Selection rules of Hydrogen atom with Examples		2	7
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	
Principles of Quantum Mechanics , by Salim AlSHamaya , University of Mosul , 1988. **Quantum Mechanics by L. I. Schif** **Quantum Mechanics by S. Allayani , KSA.**	Required readings : 5. Course Books 6. Other
• 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: 2020-2021**
7. Number Of Study Hours (Total)	**60 Theoretical Hours + 60 Practical Hours**
8. Date This Description Was Prepared	**2/10/2021**
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-Dirc statisties - Plasmon Electrical conductivity**		2	5
Oral exam with written test exams	Lecture	**Effcctive mass-fermi surface constriction Semiconductors (intrinsic and entrinsic Mobility and electrical Conductivity**		2	6
Attendance test (various questions)		Semester Exam			7
Oral exam with written test exams	Lecture	**- Crystal defects and dislocation - Point, lines .defects - surface, Volume defects**		2	8

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	
4. **1- Solid State Physics / Dr. Moaeed Gabriel.** 5. **2- Electrical and magnetic properties / Dr. Wakaa Al-Jubouri and Dr. Fahd Ghalib.** 6. **Solid state physics / Dr. Yahya Nouri Al-Jamal/University of Mosul**	Required readings : 7. Course Books 8. Other

• PowerPoint	Special Requirements
Attending scientific seminars	Social services (e.g. guest lectures, vocational training and field studies)

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 / 2020-2021	**51. Semester / Year**
2 hours per week * 15 weeks = 30 hours / semester	**52. Number of Credit Hours (Total)**
2021/2/10	**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
Q. 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.
R. 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. ommunicate 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
S. **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

T. 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 + Assignments	Lecture + desiccation	Grammar	knowledge and understanding	2	9

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	*Thestudent'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 / **2020-2021**	**64. Semester / Year**
3 hours theoretical + 3 hours practical / week * 15 weeks = 90 hours / semester	**65. Number of Credit Hours (Total)**
19-9--2021	**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)	

69. Course Structure

Evaluation method	Method of education	Name of the unit/course or topic	Required Learning Outcomes	Hours	The week
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, discussion, assignments, and monthly exams	Lecture + Lab	A X-ray diffraction	Familiarizing the student with X-ray diffraction and how it is done	3 theoretical 3 Practical	9
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 / 2020-2021	**77. Semester / Year**
3 hours theoretical + 3 hours practical / week * 15 weeks = 90 hours / semester	**78. Number of Credit Hours (Total)**
2021/2/10	**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

W. 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.

X. 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

Y. 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

Z. 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

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 ا questions	Lecture + Lab	Negative -6 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	Barrier voltage 5- -4 PN junction at rest 6- PN junction power diagram 7- Calculation of barrier voltage 8- PN junction under external influence 9- Front bias -10of PN junction Reverse PN junction bias	*Know the basics of the work of the crystalline diode	3 theoretical 3 Practical	5
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	- Full wave rectifier 4 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	- Voltage multiplier 9 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	The principle of -3 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-	*Know the basics of the transistor work and ways to connect the transistor	3 theoretical 3 Practical	12

		Solved examples			
Short questions	Lecture + Lab	Transistor Action -7 Zones 8- Active Zone 9- Cutting Area 10 Saturation Zone 11- 11- Solving Fifth Chapter Exercises	*Know the areas where the transistor works	3 theoretical 3 Practical	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review	*Thestudent'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. Riyad 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
• 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 / 2020-2021	**90. Semester / Year**
3 hours theoretical / week * 15 weeks = 45 hours / semester	**91. Number of Credit Hours (Total)**
2021/2/10	**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

AA. 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.

BB. Subject-specific skills

7. -The student concludes that there is a physical basis upon which the work of any electromagnitic 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

CC. 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

DD. 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

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 + Assignmen ts	Lecture + desiccation	boundary conditions of the field vectors	knowledge and understanding	3 theoretical	9
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	*Thestudent'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 / 2020-2021	**103. Semester / Year**
3 hours theoretical +3 practical/ week * 15 weeks = 90 hours / semester	**104. Number of Credit Hours (Total)**
2021/9/20	**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
EE. 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
FF. 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
GG. **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

HH. 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

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, resolving power**		3 theoretical	6

		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,April2013**	Required readings : 17. Course Books 18. Other
• 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 / 2020-2021	**116. Semester / Year**
3 hours theoretical +3 practical/ week * 15 weeks = 90 hours / semester	**117. Number of Credit Hours (Total)**
2021/9/20	**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
II. 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
JJ. 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
KK. **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

LL. 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

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
Short questions	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 +	Lecture + Lab	Spherical mirrors		3 Practical	9

Assignments					
Short questions	Lecture + Lab	IMAGE FORMATION IN SPHERICAL MIRRORS		3 theoretical	10
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,April2013	Required readings : 19. Course Books 20. Other
• 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 / 2020-2021	**129. Semester / Year**
2 hours theoretical / week * 15 weeks = 30 hours / semester	**130. Number of Credit Hours (Total)**
2021/9/20	**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

MM. 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.

NN. 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

OO. **Thinking skills**

- Ask various questions and brainstorm

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- **Teaching and learning methods**

- Discussion, lecture, questioning

- **Evaluation methods**

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

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

34. Verbal teaching behavior skills such as discussion, dialogue, explanation and interpretation.
35. 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
36. Planning skill: such as the skill of determining the subject of the lesson, using appropriate means, preparing questions
37. Implementation skills: such as stimulating students' motivation, controlling and managing the classroom
38. 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		theoretical2	2
Short ا questions	Lecture	Interaction between laser light and the material		theoretical2	3
اسئلة قصيرة	Lecture	Enstien's coeffiecients		theoretical2	4
Short questions in addition to assignments	Lecture	Population at thermal equilibrium		theoretical2	5
Short questions	Lecture	Principles of laser production		theoretical2	6
Attendance test (various questions)		Plans of pumping		theoretical2	7
Short questions	Lecture	Methods of pumping		theoretical2	8

Short Questions + Assignments	Lecture + Lab	Resonator definition and operation		theoretical2	9
Short questions	Lecture + Lab	Laser resonator stability		theoretical2	10
Short questions	Lecture + Lab	Resonator design		theoretical2	11
Short questions	Lecture + Lab	Laser output		theoretical2	12
Short questions	Lecture + Lab	Laser types		theoretical2	13
Attendance test (various questions)		Semester Exam			14
Drawing an illustration of the material studied during the class		Review			15

135. Infrastructure	
Required readings : 21. Course Books 22. Other	1- فيزياء الليزر وبعض التطبيقات العملية"، سهام عفيف قندلا. دار النشر دار الشؤون الثقافية العامة سنة النشر **1992** 2-الليزر و تطبيقاته المؤلف فاروق بن عبد الله الوطبان الناشر دار المريخ للنشر, **1987**
Special Requirements	• PowerPoint
Social services (e.g. guest lectures, vocational training and field studies)	Attending scientific seminars

136. Acceptance	
Prerequisites	
Minimum number of students	
The largest number of students	