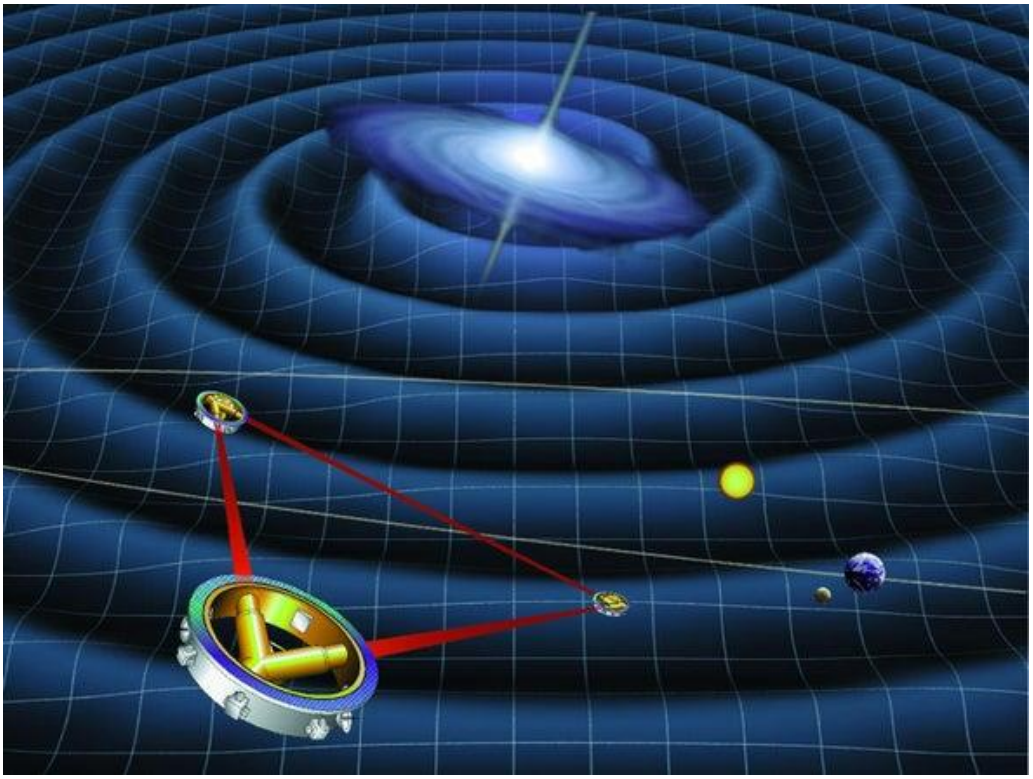
Kingdom of Saudi Arabia
Umm Al-Qura University
Faculty of Applied Science
Physics Department

المملكة العربية السعودية
جامعة أم القرى
كلية العلوم التطبيقية
قسم الفيزياء

Module Handbook of Physics Program (Plan 37)

Course Specifications



بسم الله الرحمن الرحيم

وَقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ
وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ
فَيُنَبِّئُكُمْ بِمَا كُنْتُمْ تَعْمَلُونَ

صدق الله العظيم

معالي مدير الجامعة
أ.د. عبدالله بن عمر بافيل

سعادة وكيل الكلية
د./ حاتم الطس

سعادة وكيل الكلية للتطوير الجامعي
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سعادة وكيلة الكلية لفرع الطالبات
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سعادة وكيل الكلية للدراسات العليا
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الدكتوره/ نهى فلمبان

مقدمة

الحمد لله رب العالمين والصلاة والسلام على سيدنا ونبينا محمد وعلي أله وأصحابه التابعين الي يوم الدين.

انشي قسم الفيزياء في عام ١٣٨٥/١٣٨٤ هـ الموافق ١٩٦٥/١٩٦٤ م، كتؤام لقسم الرياضيات وذلك عندما صدرت أول لائحة لكلية التربية بجامعة الملك عبد العزيز شطر مكة المكرمة، وقد تخرجت عدة دفعات على نظام التخصص المزدوج (فيزياء ورياضيات).

استمر العمل على هذا النظام لمدة عشر سنوات، حتى عام ١٣٩٥/١٣٩٤ هـ حيث تم فصل قسم الفيزياء عن قسم الرياضيات، وأصبح قسما قائما بذاته يمنح درجة البكالوريوس في الفيزياء والفيزياء الطبية.

وفي عام ١٣٩٧/١٣٩٦ هـ، ادخل نظام الساعات المعتمدة على جامعة الملك عبد العزيز شطر مكة المكرمة، وأصبح القسم يقدم مقرراته وفقا لنظام الساعات المعتمدة. ويمنح درجة البكالوريوس في الفيزياء. وفي عام ١٤٠١/١٤٠٠ هـ تأسست جامعة أم القري بمكة المكرمة، ثم أنشئت كلية العلوم التطبيقية وأصبح القسم تابعا لها. وأصبح يمنح درجة البكالوريوس في الفيزياء والفيزياء الطبية.

وهناك ثلاث خطط دراسية من اهم الخطط بالنسبة للقسم، وهي خطة ١٩، وخطة ٣٣، وخطة ٣٧ والأخيرة وهي الاحدث وقيد التنفيذ الان وفيما يلي نستعرض توزيع المقررات وتوصيف البرنامج ومقررات تلك الخطة.

وفقنا الله و اياكم الي ما يحبه و يرضاه ،،،،،،،

Vision of Physics Department

Achieving leadership in physics and medical physics at the local and international levels and actively participating in the community institutions.

Mission of Physics Department

Innovation and excellence in higher education and scientific research in physics and medical physics, the graduation of students highly skilled scientifically and technically, and the contribution to the service and development of the community

Objectives of Physics Department

- To achieve leadership in higher education, scientific research and community service
- To upgrade graduates level through the achievement of comprehensive quality standards.
- To prepare advanced and innovative educational programs that qualify the graduates to keep up with the requirements of knowledge society and labor market.
- To provide students with basic knowledge and skills in physics and medical physics.
- To promote scientific research and to qualify specialized scientific and professional cadres to contribute to carrying out distinguished scientific and practical researches.
- To serve community organizations through effective partnerships
- To form partnerships with research centers and prestigious global universities.
- To attract distinguished scientific and administrative cadres.

Description of the Physics program Curriculum (1437 A.H)

(Total Credit hours 130h)

First year (Level 1): Credit hours 16				
Course		Hours		Prerequisite
Code	Title	L	P	
4041101	CALCULUS 1	4	-	
4021101	GENERAL CHEMISTRY (1)	3	1	
7004101	ENGLISH LANGUAGE	4	-	
605101	THE HOLY QUR'AN (1)	2	-	
601101	ISLAMIC CULTURE (1)	2	-	

First year (Level 2): Credit hours 16				
Course		Hours		Prerequisite
Code	Title	L	P	
4011101	GENERAL BIOLOGY	3	1	
4031101	GENERAL PHYSICS	3	1	
7004102	ENGLISH LANGUAGE	4	-	7004101
501101	ARABIC LANGUAGE	2	-	
102101	BIOGRAPHY OF PROPHET MOHAMED (PBUH)	2	-	

Second year (Level 3): Credit hours 16				
Course		Hours		Prerequisite
Code	Title	L	P	
4042501	Differentiation and Integration	4	-	4042101
4042402	Linear Algebra	4	-	4042101
4032102	General Physics (2)	3	1	4031101
4032121	Electricity and magnetism	3	1	4031101

Second year (Level 4): Credit hours 17				
Course		Hours		Prerequisite
Code	Title	L	P	
4032141	THEORETICAL METHODS IN PHYSICS (1)	4	-	4032141
4032131	OPTICS	3	1	4032102
4032150	MODERN PHYSICS	3	1	4032141
4032122	GENERAL PHYSICS (3)	2	1	4032102
601201	ISLAMIC CULTURE (2)	2		605101

Third year (Level 5): Credit hours 17				
Course		Hours		Prerequisite
Code	Title	L	P	
4033142	THEORETICAL METHODS IN PHYSICS (2)	4	-	4032141
4033143	CLASSICAL MECHANICS (1)	4	-	4032102
4033145	QUANTUM MECHANICS (1)	4	-	4032141
4033110	HEAT AND THERMODYNAMICS	3	-	4032102
605201	THE HOLY QUR'AN (2)	2	-	605101

Third year (Level 6): Credit hours 16				
Course		Hours		Prerequisite
Code	Title	L	P	
4033132	ELECTROMAGNETISM (1)	3	-	4032141
4033146	QUANTUM MECHANICS (2)	3	-	4033145
4033111	STATISTICAL THERMODYNAMICS	3	-	4033110
4033144	CLASSICAL MECHANICS (2)	2	-	4033143
605301	THE HOLY QUR'AN (3)	2	-	605201
601301	ISLAMIC CULTURE (3)	3	-	601201

Fourth year (Level 7): Credit hours 16				
Courses		Hours		Prerequisite
code	title	L	P	
4034133	ELECTROMAGNETISM (2)	3	-	4033132
4034160	NUCLEAR PHYSICS	3	1	4033145
4034170	SOLID STATE PHYSICS (1)	4	-	4033145
4034180	COMPUTATIONAL PHYSICS	2	1	4033142
605401	THE HOLY QUR'AN (4)	2	-	605301

Fourth year (Level 8): Credit hours 16				
Course		Hours		Prerequisite
code	title	L	P	
4034162	RADIATION PHYSICS	3		4034160
4034172	SOLID STATE PHYSICS (2)	3	1	4034170
4034173	ELECTRONICS	3	1	4034170
4034199	GRADUATED PROJECT	3	-	
601401	ISLAMIC CULTURE (4)	2	-	601301

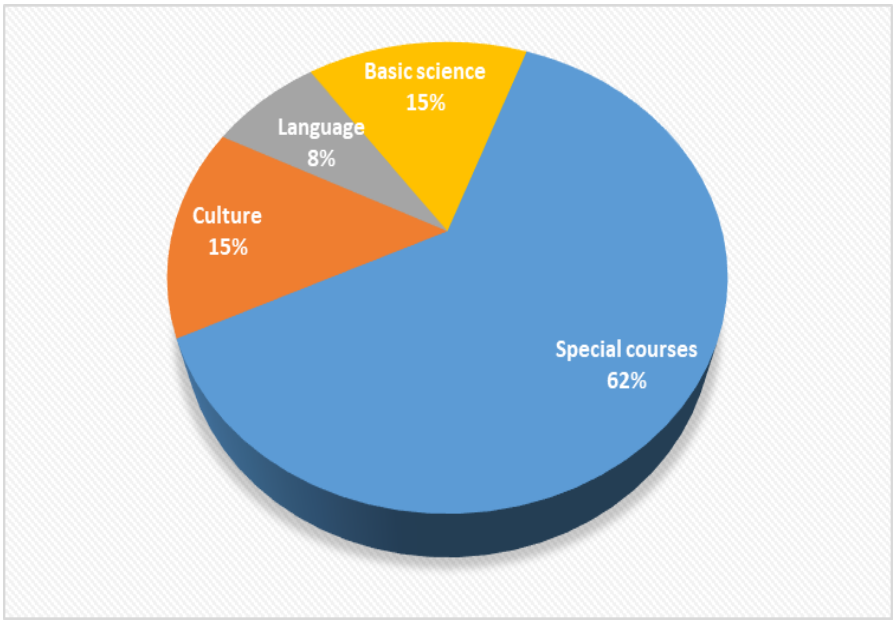

Figure 1: The curriculum structure of the program.

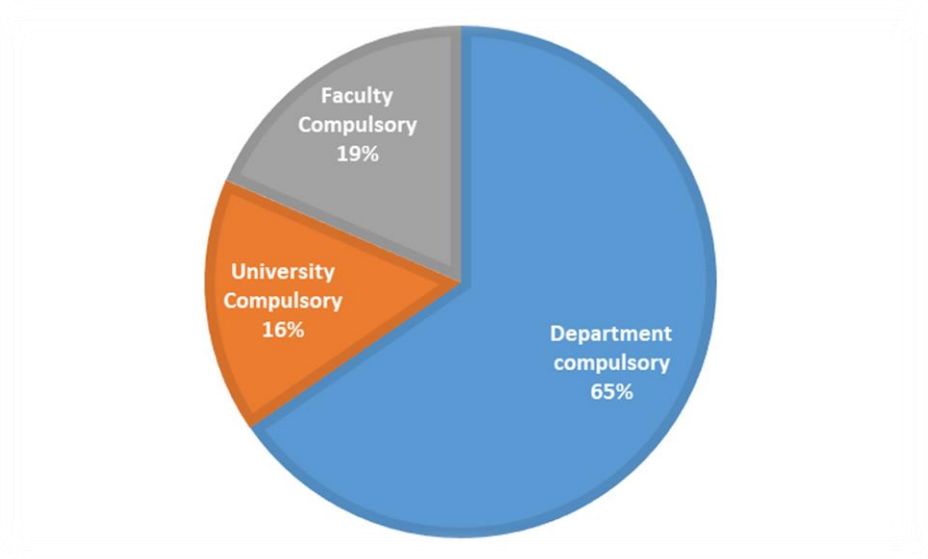

Figure 2: Curriculum Distribution

Study Plan for Physics Program (plan 37)

Courses Specifications

Course of plan 37

	Code	Course title
1	4031101-4	General physics
2	**4032102-4**	General physics (2)
3	4032121-4	Electricity and magnetism
4	**4032141-4**	Theoretical methods in physics (1)
5	4032131-4	Optics
6	**4032150-4**	Modern physics
7	4032122-3	General physics (3)
8	**4033142-4**	Theoretical methods in physics (2)
9	4033143-4	Classical mechanics (1)
10	**4033145-4**	Quantum mechanics (1)
11	4033110-3	Heat and thermodynamics
12	**4033132-3**	Electromagnetism (1)
13	4033146-3	Quantum mechanics (2)
14	**4033111-3**	Statistical thermodynamic
15	4033144-2	Classical mechanics (2)
16	**4034133-3**	Electromagnetism (2)
17	4034160-4	Nuclear physics
18	**4034170-4**	Solis state physics (1)
19	4034180-3	Computational physics
20	**4034162-3**	Radiation physics
21	4034172-4	Solis state physics (2)
22	**4034173-4**	Electronics
23	4034199-3	Graduated project

Courses Specifications

Course Title:	**General Physics 101**
Course Code:	**4031101-4**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours: 4
2. Course type **a.** University ☐ College ☑ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 2/ 1st year
4. Pre-requisites for this course (if any)**:**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	42
3	**Tutorial**	
4	**Others** (specify) exam and quizzes	6
	Total	93
Other Learning Hours*		
1	**Study**	89
2	**Assignments**	15
3	**Library**	
4	**Projects/Research Essays/Theses (practical)**	22
5	**Others** (specify) exam and quizzes	20
	Total	146

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of physics, such as measurements, work and energy, Newton's laws, heat, fluid mechanics, and light. This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

After completing this course student should be able to:

1. Define the concepts of the measurements.
2. Define the concepts measuring length.
3. Define the concepts of measuring time.
4. Define the concepts of measuring weight.
5. Differentiate between the distance, the position, and the displacement.
6. Differentiate between the speed and the velocity.
7. Differentiate between the average velocity and the instantaneous velocity.
8. Define the concepts of the acceleration.
9. Differentiate between the average acceleration and the instantaneous acceleration.
10. Differentiate between the linear acceleration and the free fall acceleration.
11. Differentiate between the vectors and the scalars
12. Analyze the vectors into their components.
13. Calculate the multiplication of the vectors.
14. Define the concepts of the force.
15. Define the relation between the force and the acceleration.
16. Apply Newton's laws of motion.
17. Differentiate between the Work and the Energy.
18. Differentiate between the Energy and the power.
19. Define the Kinetic energy of the body.
20. Define the concept of the density of the body.
21. Define the concept of the pressure within the fluid.
22. Define the concept of Pascal principle.
23. Define the concept of Archimedes' principle.
24. Define the concept of Bernoulli's Equation.
25. Define the concept of the temperature
26. Differentiate between the Celsius Scale and Fahrenheit scale of temperature.
27. Define the laws of reflection through plane mirrors and spherical mirrors.
28. Define the laws of refraction through thin lenses.
29. Apply the laws of thin lenses.

In addition to these items, the students should gain practical skills through performance some experimental class.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	**Define** the physical quantities, physical phenomena, and basic principles of physics related to the course.	K1
1.2	**Express** the physical laws related to the course using mathematics.	K2
1.3	**Record** the physical quantity at the lab.	K3
2	**Skills:**	
2.1	**Calculate** the physical quantity related to the course.	S1
2.2	**Solve** physical problems	S1
2.3	**Drive** physics laws.	S2
2.4	**Determine** some physical quantity at the lab.	S3
3	**Competence:**	
3.1	**Work** effectively in groups.	C1
3.2	**Show** responsibility for self-learning to be aware with recent developments in physics.	C2

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Measurement** 1- The physical quantities, standards, and Units. 2- The international system of units. 3- The Standard of time 4- The Standard of length 5- The Standard of Mass 6- Precision and significant figures. 7- Dimensional analysis.	**6**
2	❖ **Vectors** 1- Vectors and Scalars. 2- Adding vectors : graphical methods 3- Components of vectors. 4- Adding vector: component method. 5- Multiplications of vectors. 6- Vector laws in physics.	**6**
3	❖ **Motion in one dimension** 1- Particles kinematics. 2- Description of motion 3- Average velocity 4- Instantaneous velocity. 5- Accelerated motion. 6- Motion with Constant Acceleration 7- Freely falling Bodies. **8-** Measuring free fall acceleration.	**3**
4	❖ **Motion in two and three dimensions** 1- Position, velocity, and acceleration. 2- Motion with constant acceleration 3- Projectile motion 4- Uniform circular motion	**3**

	5- Velocity and acceleration vectors in circular motion	
5	❖ **Force and motion** 1- Position, velocity, and accelerations 2- Motion with constant acceleration. . 3- Newtons first and second laws. 4- Forces. 5- Newtons second law 6- Newton's third law. 7- Units of force 8- Weight and mass 9- Measuring forces 10- Applying Newton's laws.	**6**
6	❖ **Work and Energy** 1. Work done by constant force. 2. Work done by a variable force: one dimensional case. 3. Work done by a variable force: two dimensional case. 4. Kinetic energy and work-energy theory. 5. Power.	**3**
7	❖ **Fluids Statics** 1. Fluids and Solids 2. Density and pressure. 3. Variation of density in a fluid at rest. 4. Pascal Principle. 5. Archimedes' Principle. 6. Surface tension.	**3**
8	❖ **Fluid dynamics** 1. General concepts of fluid flow 2. Streamlines and the equation of continuity. 3. Bernoulli's Equation 4. Application of Bernoulli's Equation 5. Viscosity.	**3**
9	❖ **Temperature, Heat and the first law of Thermodynamics.** 1. Heat: Energy in transit 2. Heat capacity and specific heat. 3. Heat capacity of solids 4. Temperature. 5. The Celsius and Fahrenheit Scales. 6. Heat transfer.	**6**
10	❖ **Reflection and refraction of light at plane surface** 1. Reflection and Refraction 2. Deriving the law of refrlection 3. Image formation by plane mirrors. 4. Deriving the law of refraction. 5. Total internal reflection.	**3**
11	❖ **Reflection and refraction of light at plane surface**	**3**

	1. Spherical mirrors 2. Spherical refracting surfaces. 3. Thin lenses 4. Compound optical systems 5. Optical instruments	
	❖ **Experimental part at the lab of general physics** 1. Safety Procedures in the Lab 2. Introduction and Graphing and Data Analysis 3. Fine Measurements 4. Force Table 5. Free Fall 6. Position and velocity and acceleration 7. Archimedes' Principle 8. Determination of Surface Tension of a liquid 9. Determining the Viscosity of a Fluid 10. Specific Heat 11. Determining the Refractive Index of a material 12. Focal length of a convex lens	**15**
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	**Define the physical quantities, physical phenomena, and basic principles of physics related to the course.**	1- Start each class with welcoming the students. 2- Give a general idea about the content of the lectrure. 3- Demonstrate the basic principles through lectures, using pictures and diagrams. 4- Discuss each item with the student through the lecture. 5- Lecturing method: Board, Power point. Discussions Brain storming	Solve some example during the lecture. Discussions during the lectures Exams: a) Quizzes (E-learning) b) Short exams (mid-term exams) c) Long exams (final) d) Oral exams
1.2	**Express the physical laws related to the course using mathematics.**		
1.3	**Record** the physical quantity at the lab.	1.teaching the student how to record the reading using different gauge correctly and safely at the lab. 2. teaching the stutnet how to desinge a suitable table to dominstrate the reading obtaind through the expermintal work.	• Tabulate the results, and • Dominstrate the results in a scientific Reports. • Lab assignments • Exam.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.0	**Skills**		
2.1	**Calculate the physical quantity related to the course.**	1. Preparing main outlines for teaching. 2. Following some proofs. 3. Define duties for each chapter 4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem.	1. Exams (Midterm, final, quizzes) 2. Asking about physical laws previously taught 3. Writing reports on selected parts of the course. 4. Discussions of how to simplify or analyze some phenomena.
2.2	**Solve** physical problems		
2.3	**Drive** physics laws**.**		
2.4	**Determine** some physical quantity at the lab.	1.Distribute the student at the lab as a teamwork. 3. Perform the paractical part of the experiments. 4. Collecting the data using different instruments. 5. Demonstrate the results as atables and grahps. 6.Analysing the results. 7.Determingin some physical quantity using the results. 8. Write the reports about the experiment. 9.Discussion with the student about the results	Writing scientific Reports. Lab assignments Exam.
3.0	**Competence**		
3.1	**Write** scinetif reports.	Inform the students about the followings: 1. How to search the internet and use the library. 2. How to cover missed lectures. 3. How to summarize lectures or to collect materials of the course. 4. How to solve difficulties in learning: solving problems – enhance educational skills. 5. Give students tasks of duties. 6. How to write reports. 7. How to work as a teamwork. 8. How to lead a Teamwork. 9. How to discuss with others .	1.Checking report on internet. 2.Discussion. 3.calculate the accuracy of the measure quantity. 4.Presenting the results.
3.2	**Show** responsibility for self-learning to be aware with recent developments in physics.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Home works	All weeks	5 %
2	Scientific activities	All weeks	5 %
3	Midterm Exam (theoretical)	9th week	20%
4	Lab. Reports (Practical)	11th week	10%
5	Final Exam (Practical)	15th week	10%
6	Final Exam (theoretical)	16th week	50%
7	**Total**		**100%**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Halliday and Resnick and Jearal Walker, " Fundamental of Physics" 8 edition, Wiley, 2008.
Essential References Materials	Physics, 4th edition , By: Halliday, Resnick, and Krane, Wiley (1992) Physics , 4th edition, By: J. Walker (2010)
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	There are enough classrooms provided with a good accommodation, including good air condition, good Data show, suitable white board. There are enough laboratories for experimental physics, provided with air conditions, good data show, and experimental equipment.
Technology Resources (AV, data show, Smart Board, software, etc.)	In each class room and laboratories, there is a data show, and board.
Other Resources	Each Class room and laboratories require a TV screen at least 65 inch-and smart, and double layer white board.

Item	Resources
(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Quashinear
Effectiveness of student assessment	Instructor	Exams
Extent of achievement of course learning outcomes	Instructor	Course report
Quality of learning resources	Instructor	Course report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics Depratment, Faculty of Applied Science, Umm AlQura University
Reference No.	
Date	

Course Title:	**General Physics 2**
Course Code:	**4032102-4**
Program:	**BSc Physics**
Department:	**Department of Physics**
College:	**College of Applied Science**
Institution:	**Umm AL – Qura University**

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: 2nd Year / Level 2
4. Pre-requisites for this course (if any)**: General physics 4031101-4**
5. Co-requisites for this course (if any)**: ---**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	45
2	Laboratory/Studio	42
3	Tutorial	
4	Exams and Quizzes	8
	Total	95
Other Learning Hours*		
1	Study	60
2	Assignments	15
3	Library	
4	Exams and Quizzes	20
5	Laboratory	20
	Total	115

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The main purpose of the course to covering some advanced physics principle in mechanics, such as particle dynamics, system of particles, collisions, rotational kinematics, rotational dynamics, oscillations, etc. This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

1- From using the E-learning web based in the university web site, the students improve their IT skill
2- Outlines of the physical laws, principles and the associated proofs.
3- Highlighting the day life applications whenever exist.
4- Encourage the students to see more details in the international web sites and reference books in the library.
5- Encourage the student to build an example of different experiments related to course

Frequently check for the latest discovery in science

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**On successful completion of this course it is expected that students will be able to:	
1.1	Recognize facts, principle and concepts of elementary Physics 1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, Power point 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it	K1
1.2	1. Demonstrating the basic principle of the experiment. 2. Show the best ways to perform the experiments 3. Show the best ways to demonstrate the results. 4. Show the best way to write the reports about the experiment. 5. Discussion with the student about the results.	K3
2	**Skills:**	
2.1	Apply the laws of physics • Preparing main outlines for teaching • .Following some proofs	S1
2.2	Solve problems in Physics by using suitable mathematical principles • Ask the student to attend lectures for practice solving problem • Encourage the student to look for the information in different references	S1
2.3	Analyse and interpret quantitative results • Preparing main outlines for teaching • Following some proofs • Define duties for each chapter	S1
2.4	Express the physical phenomena mathematically • Following some proofs • Define duties for each chapter • Encourage the student to look for the information in different references • Ask the student to attend lectures for practice solving problem	S2

CLOs		Aligned PLOs
3	**Competence:** On successful completion of this course it is expected that students will be able to:	
3.1	Show responsibility for self-learning to be aware with recent developments in physics • Search through the internet and use the library. • Lab work. • Small group discussion. • Enhance educational skills.	C1
3.2	Work effectively in groups and exercise leadership when appropriate. • Develop their interest in Science through :(lab work, field trips, visits to scientific and research. • Encourage the student to attend lectures regularly Give students tasks of duties	C3

C. Course Content

No	List of Topics	Contact Hours
1	**Particle dynamics** 1- Force laws. 2- Frictional Forces. 3- The Dynamics of uniform Circular motion 4- Equation of motion: constant and non-constant forces. 5- Time-dependent forces; analytical methods 6- Time-dependent forces: numerical methods. 7- Drag forces and the motion of projectiles.	3
2	**Conservation of energy** 9- Conservative force. 10- Potential energy. 11- One dimensional conservative systems. 12- Two-and three-dimensional conservative systems. 13- Conservation of energy of a system of particles. 14- Mass and energy. 15- Quantization of energy.	3
3	**System of particles** 7- Two particle system 8- Many particle system 9- Centre of mass of solid objects 10- Linear momentum of system of particles. 11- Conservation of linear momentum 12- Work and energy in system of particles 13- Systems of variable mass.	3
4	**Collisions** 1- What is collisions? 2- Impulse and momentum. 3- Conservation of momentum during collision.	3

	4- Collisions in one dimension. 5- Two dimensional collisions. 6- Center of mass reference frame. 7- Spontaneous decay process.	
5	**Rotational Kinematics** 1- Rotational motion. 2- Rotation variables. 3- Rotation with constant angular acceleration. 4- Rotational quantities as vectors. 5- Relationship between linear and angular variables: scalar form. 6- Relationship between linear and angular variables: vector form.	4
6	**Rotational dynamics** 6. Rotational dynamics 7. Kinetic energy of rotation and rotational inertia. 8. Rotational inertia of solid bodies 9. Rotational dynamics of rigid body 10. Combined rotational and translational motion.	3
7	**Angular momentum** 1- Angular momentum of a particle 2- System of particles 3- Angular momentum and angular velocity 4- Conservation of angular momentum 5- The spinning top. 6- Quantization of angular momentum.	3
8	**Equilibrium of Rigid bodies** 1- Condition of equilibrium. 2- Center of Gravity. 3- Examples of equilibrium. 4- Stable, unstable, and Neutral equilibrium or rigid bodies in a gravitational field. 5- Elasticity.	3
9	**Oscillations.** 7. Oscillating systems. 8. The simple harmonic oscillator. 9. Simple harmonic motion 10. Energy considerations in simple harmonic motion. 11. Applications of simple harmonic motion 12. Simple harmonic motion and uniform circular motion. 13. Combinations of harmonic motions 14. Damped harmonic motions 15. Forced harmonic motions. .	4
10	**Gravitation** 7. Gravitation from the Ancients to Kepler. 8. Newton and the law of universal gravitation. 9. The gravitation constant G 10. Gravity near the Earth's surface.	4

	11. Gravitational Effect of a spherical distribution of matter 12. Gravitational potential energy 13. The gravitational field and potentials 14. The motions of planets and satellites Universal gravitation. .	
11	Wave Motion 6. Mechanical waves. 7. Types of waves. 8. Traveling waves. 9. Wave speed 10. The wave equation 11. Power and intensity in wave motion 12. The principle of superposition 13. Interference of waves 14. Standing wave. 15. Resonance.	3
12	**Sound Wave** 1. The speed of sound. 2. Traveling longitudinal waves. 3. Power and intensity of sound waves. 4. Standing longitudinal waves. 5. Vibrating systems and sources of sound. 6. Beats 7. The Doppler effect	3
13	**Solved problems**	6
Total		**45hrs**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Recognize facts, principle and concepts of elementary Physics	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, Power point 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Exams: a) Quizzes (E-learning) b) Short exams (mid-term exams) c) Long exams (final) d) Oral exams Discussions during the lectures.
1.2	Describe concepts, Procedures of some experiments in physics	Describe concepts, Procedures of some experiments in physics the reports about the experiment.. Discussion with the student about the results.	Home work. Writing scientific Reports. Doing team research or team project.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
			Doing team work to perform some experiments Discussions during the class
…			
2.0	**Skills**		
2.1	Apply the laws of physics.	1. Preparing main outlines for teaching 2.Following some proofs 3.Define duties for each chapter 4.Encourage the student to look for the information in different references 5.Ask the student to attend lectures for practice solving problem	1.Midterm's exam. Exams, short quizzes 2.Asking about physical laws previously taught 3.Writing reports on selected parts of the course 4.Discussions of how to simplify or analyze some phenomena
2.2	Solve problems in Physics by using suitable mathematical principles		
2.3	Analyse and interpret quantitative results		
2.4	Express the physical phenomena mathematically.		
3.0	**Competence**		
3.1	Show responsibility for self-learning to be aware with recent developments in physics	• Search through the internet and use the library. • Lab work. • Small group discussion. • Enhance educational skills. • Develop their interest in Science through :(lab work, field trips, visits to scientific and research. • Encourage the student to attend lectures regularly Give students tasks of duties	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific values of reports. • Evaluate the work in team • Evaluation of the role of each student in lab group assignment Evaluation of students presentations
3.2	Work effectively in groups and exercise leadership when appropriate.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10%
2	Participation in activities lectures and labs	All weeks	10%
3	Midterm Exam (theoretical)	8th week	30%
4	Lab. Reports (Practical)	11th week	10%
6	Final Exam (theoretical)	16th week	40%
7			
8			
9			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester. (4hrs per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Physics, 4th edition , By: Halliday, Resnick, and Krane, Wiley (1992)
Essential References Materials	
Electronic Materials	https://phet.colorado.edu/en/simulations/category/physics www.uqu.sa/baewiss
Other Learning Materials	Physics , 4th edition, By: J. Walker (2010)

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	There are enough classrooms provided with a good accommodation, including good air condition, good Data show, suitable white board. There are enough laboratories for experimental physics, provided with air conditions, good data show, and experimental equipment.
Technology Resources (AV, data show, Smart Board, software, etc.)	In each class room and laboratories, there is a data show, and board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Each Class room and laboratories require a TV screen at least 65 inch-and smart, and double layer white board

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	Students Classroom Observation Committee Professional Development Unit External Reviewers such as the CEA Accreditation Agency	Student Surveys Formal Classroom Observation
Effectiveness of Assessment	Curriculum and Test Development Unit Curriculum Committee Assessment Committee External Reviewers such as the CEA Accreditation Agency	Item Analysis Data Teacher Feedback Student Feedback Course Reports
Extent of Achievement of Course Learning Outcomes	Quality Assurance Unit Curriculum and Test Development Unit	Item Analysis Data Course Reports Annual Program Review

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Electricity and Magnetism**
Course Code:	**4-4032121**
Program:	**BSc**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**UQU**

A. Course Identification

1. Credit hours:	**4hrs**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☐ Elective ☐
3. Level/year at which this course is offered:	**2nd Year / Level 3**
4. Pre-requisites for this course (if any)**:**	**General physics 4031101– 4**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3	75%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other	3	25%

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	45 Hours
2	Laboratory/Studio	42 Hours
3	Tutorial	
4	Others (specify) Exams & quizzes	8 Hours
	Total	95 Hours
Other Learning Hours*		
1	Study	60 Hours
2	Assignments	15 Hours
3	Library	20 Hours
4	Projects/Research Essays/Theses	
5	Others (specify) Practical	20 Hours
	Total	115 Hours

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields. It covers the followings: Electric charge, electric fields, superposition, Gauss' Law, surface integrals, electric flux, the electric potential, simple circuits, Ohm's Law, magnetic fields, Ampere's Law, electromagnetic induction, capacitors, inductors.

2. Course MainObjective

1. Provide and define the fundamental properties of the electric charge, solve technical problems associated with the electrostatic force (Coulomb force),
2. Identify that at every point in the space surrounding a charged particle, the particle sets up an electric field , which is a vector quantity and thus has both magnitude and direction.
3. Identify how an electric field can be used to explain how a charged particle can exert an electrostatic force on a second charged particle even though there is no contact between the particles.
4. Explain how a small positive test charge is used (in principle) to measure the electric field at any given point.
5. Define electric capacitance and solve technical problems associated with capacitors of various symmetries, capacitors in series and parallel combination, the microscopic effect of dielectric materials on capacitance and stored energy.
6. Define electric current, current density, and solve technical problems involving DC networks of resistors, batteries, and capacitors, Ohm's Law, Kirchhoff's laws, and RC charging and decay circuits.
7. Calculate the potential difference between any two points in a circuit.
8. Distinguish a real battery from an ideal battery and, in a circuit diagram, replace a real battery with an ideal battery and an explicitly shown resistance.
9. Calculate the net rate of energy transfer in a real battery for current in the direction of the emf and in the opposite direction.
10. Define the magnetic field and magnetic flux, solve technical problems associated with the effect of static, non-uniform and uniform magnetic fields on moving charges and current-carrying wires, loops and the magnetic dipole.
11. Calculate the magnitude and direction of the magnetic field for symmetric current distributions using the Law of Biot-Savart and Ampere's Law, and state the limitations of Ampere's Law.
12. State Faraday's Law of Induction with Lenz's Law and use these equations to solve technical problems associated with induction.
13. Calculate inductance according to the fundamental definition, solve technical problems associated with LR circuits and coils, and calculate the stored energy in magnetic fields.

In addition to these items, the students should gain practical skills through performance some experimental class.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge:**	
1.1	Recognize most fundamental concepts of electric charge, electric current, and electric and magnetic fields.	K1+K2
1.2	Relate electric and magnetic fields to their sources.	K1+K2
1.3	Extract electric potential from electric field, and vice versa.	K1+K2
1.4	Learn students how charges and currents respond to electric and magnetic fields and also how charges and current generate electric and magnetic fields.	K1+K2
1.5	Investigate practical fundamentals of linear electric circuit components and how their operation is governed by the fundamental laws of electricity and magnetism.	K3
2	**Skills:**	
2.1	Applying physics concepts toward solving a broad range of problems – including conceptual and technical problems, both familiar and unfamiliar – with clarity, precision, logical coherence, and mathematical sophistication.	S1+S3
2.2	Capacity to explain problem-solving work correctly, clearly, and completely, further demonstrating the breadth and depth of their understanding.	S2+S3
2.3	Perform simple lab experiments.	S2
2...		
3	**Competence:**	
3.1	Relate theoretical scientific concepts to experimental results.	C1+C2
3.2	Show responsibility for how physics as a discipline can be used to obtain a deep understanding of how the world really works and how that knowledge can be used to make predictions and solve problems.	C1+C3
3.3	Demonstrate effective written and oral communication skills, especially the ability to transmit complex technical information in a clear and concise manner.	C1+C2
3.4	Work effectively both individually and in teams.	C1

C. Course Content

No	List of Topics	Contact Hours
1	**Electric charge and Coulomb's law:** Electric Charge, Conductors and Insulators, Coulomb's law, Charge is Quantized, Charge is Conserved, Sample problems.	**4**
2	**Electric Fields:** Charges and Forces, The Electric Field, Electric field lines, Electric Field Due to a Point Charge, Electric Dipole, Electric Field Due to Continuous Charge Distribution, A Point Charge in an Electric Field, A Dipole in an Electric Field, Sample problems.	**5**
3	**Gauss' Law:** Flux of an Electric Field, Gauss' Law, Gauss' Law and Coulomb's Law, Conductors in Equilibrium, Applying Gauss' Law:	**6**

	Cylindrical Symmetry, Applying Gauss' Law: Planar Symmetry, Applying Gauss' Law: spherical Symmetry.	
4	**Electric potential:** Electric Potential Energy, Electric Potential, Equipotential surfaces, Calculating the potential from the field, Potential Due to a Point Charge, Potential Due to a group of Point Charges, Calculating the field from the potential, Electric Potential Energy of a System of Point Charges, Potential of a Charged Isolated Conductor.	**6**
	1st Periodic Exam	**1**
5	**Capacitors and Capacitance:** Capacitors, Capacitance, Calculating the Capacitance, Capacitors in Parallel and in Series, Energy Stored in an Electric Field, Capacitor with a Dielectric.	**4**
6	**Current and Resistance:** Electric Currents, Current density, Resistance and Resistivity, Ohm's Law, Power in Electric Circuits.	**5**
7	**DC Circuits:** Electromotive Force,Electric Power, Kirchhoff's Rules, Calculating the Current in a Single Loop, Potential Differences, Resistors in Series and Parallel, Multiloop Circuits, Charging and Discharging Capacitors, RC Circuits.	**5**
	2nd Periodic Exam	**1**
8	**Magnetic Field:** Sources of Magnetic Field, Magnetic Force on a Moving Charge, Circulating Charges, Hall Effect, Magnetic Force on a Current, Torque on a Current LoopThe Magnetic Force on a Current, The Magnetic Dipole.	**6**
9	**Ampere's Law:** Biot-Savart' Law, Applications of Biot-Savart Law, Lines of Magnetic Field, Ampere's Law, Solenoids and Toroids.	**6**
10	Note: The lab experiments are presented and taught separately (3 hrs./week). Below is the list of the experiments: 1. General introduction 2. Determining the capacitance of a capacitor. 3. Capacitors in series and parallel 4. Verification of Ohm's law. 5. Resistors in series and parallel. 6. Determining the time constant of an RC circuit. 7. Kirchhoff's rules. 8. Electrical resistivity. 9. Magnetic force on a current-carrying wire 10. Biot-Savart law: Measuring the magnetic field for straight and circular conductors as a function of current. 11. Verification of the relationship between the magnetic field of a straight conductor and the distance from the conductor. 12. Magnetic field of a solenoid. 13. Review (2 weeks).	**42**
	Lab Final Exam	**2**
	Final exam	**2**
Total		**95**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	Recognize most fundamental concepts of electric charge, electric current, and electric and magnetic fields.	**1.** Lectures. **2.** Discussions **3.** Slides and computer simulation software may be used by the teachers to clarify concepts. **4.** Problems solving	**1-** Home work assignments. **2-** Group Project assignment. **3-** Question –answer session in class. **4-** Exams: quizzes, Mid-term and final exams
1.2	Relate electric and magnetic fields to their sources.		
1.3	Extract electric potential from electric field, and vice versa.		
1.4	Learn students how charges and currents respond to electric and magnetic fields and also how charges and current generate electric and magnetic fields.		
1.5	Investigate practical fundamentals of linear electric circuit components and how their operation is governed by the fundamental laws of electricity and magnetism.		
2.0	**Skills**		
2.1	Applying physics concepts toward solving a broad range of problems – including conceptual and technical problems, both familiar and unfamiliar – with clarity, precision, logical coherence, and mathematical sophistication.	**1.** Lectures. **2.** Discussions. **3.** Problems solving. **4.** Ask the students to search the internet and use the library. **5.** Encourage them how to attend lectures regularly by assigning marks for attendance. **6.** Small group discussion. **7.** Give students tasks of duties.	**1-** Question –answer session in class. **2-** Exams: quizzes, Mid-term and final exams **3.** Evaluation of the role of each student in group Project assignment **4.** Evaluation of student's presentations. **5.** Direct contact during office hours.
2.2	Capacity to explain problem-solving work correctly, clearly, and completely, further demonstrating the breadth and depth of their understanding.		
2.3	Perform simple lab experiments.	Lab work	**1.** Lab Reports **2.** Lab exam
3.0	**Competence**		
3.1	Relate theoretical scientific concepts to experimental results.	**1.** Lab work. **2.** Discussions.	**1.** Lab Reports **2.** Lab exam
3.2	Show responsibility for how physics as a discipline can be used to obtain a deep understanding of how the world really works and how that knowledge	**1.** Lectures. **2.** Discussions. **3.** Problems solving.	**1-** Question –answer session in class.

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
	can be used to make predictions and solve problems.	**4.** Ask the students to search the internet and use the library. **5.** Encourage them how to attend lectures regularly by assigning marks for attendance. **6.** Small group discussion. **7.** Give students tasks of duties.	**2-** Exams: quizzes, Mid-term and final exams **3.** Evaluation of the role of each student in group Project assignment **4.** Evaluation of student's presentations. **5.** Direct contact during office hours.
3.3	Demonstrate effective written and oral communication skills, especially the ability to transmit complex technical information in a clear and concise manner.		
3.4	Work effectively both individually and in teams.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homeworks & Participation in activities during lectures/or quizzes	All weeks	10%
2	Lab reports	All weeks	10%
3	1st Periodic Exam	7th week	10%
4	2nd Periodic Exam	12th week	10%
5	Lab Final Exam	16th week	10%
6	Final exam	18th week	50%
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Besides discussions in class and lab, Students are supervised by academic advisors in physics Department. The time tables for academic advisors are given to the student on the beginning of each semester.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Fundamentals of Physics, 9th Edition, by David Halliday, Robert Resnick, Jearl Walker, Wiley; 9th Edition, Binder Ready Version edition (March, 2010).
Essential References Materials	University Physics with Modern Physics, Volume 2 (14th Edition), by Hugh D. Young, Roger A. Freedman, Pearson; (January 9, 2015)

Electronic Materials	The website of the faculty member
Other Learning Materials	Lab manual.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms, equipped laboratories and library.
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NA

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Quality of learning resources	Students	Each student evaluates the course by completing the online assessment form on the student's website at the end of each semester. The course instructor will then collect the data and send the Feedback to the relevant committee.
Effectiveness of teaching and assessment, Quality of learning resources	Faculty members	All course instructors meet Periodically and discuss the issues and potential areas of improvements. The final suggestions are always taken into consideration by the coordinator of the course.
Effectiveness of teaching and assessment, Quality of learning resources	Instructor from another faculty.	Feedback evaluation by relevant committee in the physics department.
Extent of achievement of course learning outcomes	Accreditation committee in the university.	Feedback evaluation by relevant committee in the physics department.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Theoretical Methods in Physics (1)**
Course Code:	**4032141-4**
Program:	**Physics**
Department:	**Physics**
College:	**College of Applied Science**
Institution:	**Umm AL – Qura University**

A. Course Identification

1. Credit hours:	**4**
2. Course type	
a.	University ☐ College ☐ Department ● Others ☐
b.	Required ● Elective ☐
3. Level/year at which this course is offered:	**4**
4. Pre-requisites for this course (if any)**: Differentiation and Integration (2) (4042501-4)**	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	4	100
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	60
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Exams and Quizes**	8
	Total	68
Other Learning Hours*		
1	**Study**	105
2	**Assignments**	15
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Exams and Quizes**	20
	Total	140

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course provides a direct preparation for an advanced study in theoretical physics and is also an interesting element in the education of an experimental physicist. The physical principles behind the mathematical models are stressed so that insight and problem solving

ability become primary. This course will cover the basic mathematical tools used in physical science and engineering: Vector analysis, partial differentiation, power and series, differential equations, special functions, integral transforms, and complex analysis. The course is designed to supply students for a variety of mathematical methods that need for advanced undergraduate and beginning graduate study in physical science and to develop a solid background for those who will continue into the mathematics of advanced theoretical physics

2. Course Main Objective

This course is designed to demonstrate and consolidate the different concepts of mathematics and algebra and ways of using them in the different branches of physics

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Recognize facts, principles and concepts of treating with vectors and scalars in mathematics and algebra	K2
1.2	Reproduce structured series of events and numbers in the form of Algebraic series.	K2
1.3	Describe physics problems in terms of mathematical expressions like partial differential equations and special functions	K2
2	**Skills:**	
2.1	Differentiate between the mathematical methods to be used for of interpreting physics problems	S1
2.2	Interpret special mathematical and algebraic functions and partial differential equations in Physics using suitable mathematical principles	S2
2.3	Discuss numerical and quantitative events and results in terms of mathematical series and special functions.	S2
3	**Competence:**	
3.1	Show responsibility for self-learning to be aware with recent developments in physics	C2
3.2	Work effectively in groups	C1

C. Course Content

No	List of Topics	Contact Hours
	❖ **Vector Analysis** 8- Triple (Scalar-Vector) products- 9- Differentiation of vectors- 10- grad, Div, Curl and Laplace's operator, 11- Vector integral- 12- Green's, Gauss' and Stokes theorems, **13-** General curvilinear coordinates- **14-** vector operators in orthogonal curvilinear coordinates	12
	❖ **Infinite series, Power series** 14- Geometric series, 15- testing series for convergence, 16- Alternating series, 17- interval of convergence- 18- expanding functions in power series, 19- Taylor and Maclaurin expansions, 20- Solving Problems about Series	8

1	❖ **Partial Differentiation** 1- Total differentials- 2- Approximating using differentials, 3- chain rule 4- Implicit differentiation, A 5- pplication to Maximum and Minimum problems, 6- Lagrange Multipliers, Change of Variables, Differentiation of Integrals	12
2	❖ **Fourier series and transforms** 1- Simple Harmonic Motion and Wave Motion; 2- Periodic Functions, 3- Average Value of a Function, 4- Fourier Coefficients, 5- Complex Form of Fourier Series, 6- Even and Odd Functions, 7- Applications of Fourier Series, Fourier Transforms	12
3	❖ **Ordinary differential equations** 1- First order differential equations; 2- separable differential equations, 3- linear 1st order equations, 4- 2nt order differential equations; 5- Homogeneous differential equations, 6- Non-homogeneous differential equations	8
4	❖ **Solution of Differential Equations by Laplace Transforms** 1- The Laplace Transform, 2- Convolution, 3- The Dirac Delta Function, 4- A Brief Introduction to Green Functions	8
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Recognize facts, principles and concepts of treating with vectors and scalars in mathematics and algebra	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Exams: a) Quizzes (E-learning) b) Short exams (mid-term exams) c) Long exams (final) d) Discussions during the lectures. Home work. Discussions during the class.
1.2	Reproduce structured series of events and numbers in the form of Algebraic series.		
…	Describe physics problems in terms of mathematical expressions like partial differential equations and special functions		
2.0	**Skills**		
2.1	Differentiate between the mathematical methods to be used for of interpreting physics problems.	1. Preparing main outlines for teaching 2. Following some proofs 3. Define duties for each chapter	1. Midterm's exam. Exams, short quizzes 2. Asking about methods previously taught
2.2	Interpret special mathematical and algebraic functions and partial		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	differential equations in Physics by suitable mathematical principles	4 .Encourage the student to look for the information in different references 5. Ask the student to attend lectures for practice solving problem	3. Discussions of how to simplify or analyze some phenomena
…	Interpret numerical and quantitative events and results in terms of mathematical series and special functions.		
3.0	**Competence**		
3.1	Show responsibility for self-learning to be aware with recent developments in physics	• Search through the internet and use the library. • Small group discussion. • Enhance educational skills. • Encourage the student to attend lectures regularly Give students tasks of duties	• Evaluate the scientific values of solutions. • Evaluate work in team • Evaluation of role of each student in group assignments • Evaluation of students presentations
3.2	Work effectively in groups		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	1st Periodic Exam	Week 9	20%
2	2nd Periodic Exam	Week 13	20%
3	Attendance and homeworks	Over the term period	10%
4	Final Exam	Week 15	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Students are supervised by academic advisers in physics Department and the time table for academic advice were given to the student each semester. (4hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1- Mary L. Boas, Mathematical methods in the Physical sciences, second edition, John Wiley and Sons (1966) and (1983). 2- G. Dennis Zill, R. Michael Cullen, Advanced engineering mathematics, Jones and Bartlett Publisher (2006), ISBN 9780763745912.
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	There are enough classrooms provided with a good accommodation, including good air condition, good Data show, suitable white board.
Technology Resources (AV, data show, Smart Board, software, etc.)	In each class room, there is a data show, and board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Course reports	Course professor	Students grades
Students Achievements.	Other staff	Revision of student answer papers by other staff members.
Analysis of students grades.	Course supervisor	Evaluation of grades distribution
Students assessment of the course	Students	

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Mohamed Salaheldin
Reference No.	
Date	13/11/2019

Course Title:	Optics
Course Code:	**4032131-4**
Program:	**BSc Physics**
Department:	**Physics**
College:	**College of Applied Science**
Institution:	**Umm AL – Qura University**

A. Course Identification

1. Credit hours:	**4 Hrs**
2. Course type	
a.	University ☐ College ☒ Department ☒ Others ☐
b.	Required ☒ Elective ☐
3. Level/year at which this course is offered:	**2nd Year / Level 5**
4. Pre-requisites for this course (if any)**:**	**4032102**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	X	**100%**
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	**45**
2	**Laboratory/Studio**	**42**
3	**Tutorial**	**8**
4	**Others** (specify)	**0**
	Total	**95**
Other Learning Hours*		
1	**Study**	
2	**Assignments**	
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (specify)	
	Total	

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of physics, such as aberrations, interference, Fourier analysis for physical optics, diffraction grating, Fourier optics and Polarization. This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields

2. Course Main Objective

The objectives of this course are to through light on nature of light. And also through light on different phenomena like interference, diffraction, polarization and their application in life.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Learning basic fundamentals in physical optics.	K1
1.2	Understanding the physics of superposition of waves, interference, diffraction, and polarization	K2
1.3	Using mathematical formula to describe the physical principle of diffraction and its relation with Fourier transform	K1
1.4	Capable of correcting the different types of lens aberrations.	K3
1.5	Classifying the different types of interference techniques.	K3
2	**Skills:**	
2.1	Apply the laws of physics to calculate some quantities concerning optics.	S1
2.2	Solve problems optics course by using suitable mathematics.	S2
2.3	Analyse and interpret quantitative results.	S3
2.4	Apply physical principles of optics on day life phenomena.	S1
3	**Competence:**	
3.1	Show responsibility for self-learning to be aware with recent developments in physics.	C1
3.2	Write scinetif reports.	C2
3.3	Work effectively in groups.	C3

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Aberations** 15- Types of aberrations . 16- Correction of aberrations.	٦
2	❖ **Interference** 21- Young double slit 22- Double beam experiments 23- General conditions of interference 24- Superposition 25- Michelson interferometer	٩

	26- Plane parallel plates 27- Fabry - Perot interferometer 28- Newtons rings	
3	❖ **Fourier analysis for physical optics** 6- Fraunhofer diffraction 7- Fraunhofer diffraction by a single slit (by integration methods) 8- Diffraction maxima and half width for single slit 9- Fraunhofer diffraction by circular slit (by integration methods) 10- Airy disk 11- Rayleigh`s criterion 12- Fresnel diffraction 13- Fresnel integrals (by integration methods) 14- Cornu spiral 10- Fresnel diffraction on single slit 11- Huygens principle	٩
4	❖ **Diffration grating** 11- One dimension gratings. 12- Grating equation. 13- Angular dispersion. 14- Chromatic resolving power. 15- Two dimension grating. 16- X ray diffraction. 7- Braggs law .	٦
5	❖ **Fourier optics** 1- Diffraction theory of image formation in the microscope 2- Optical image processing. 3- Transfering functions	٦
6	❖ **Polarization** 1- Types of polarized light 2- Production of polarized 3- Optical active phenomena 4- Polarization caused by electric and magnetic fields	٦
٧	❖ **Exercises and Solved problems**	٣
Total		٤٥

Practical part:

1. Safety and Security in the lab.
2. Introduction.
3. Interference of Light and eye resolving power.
4. Diffraction of Light.
5. Newton's Rings.
6. Polarization of Light and Brewster’s angle.
7. Diffraction Grating .
8. Study of prism properties using Spectrometers Thermopiles.
9. Abbe refractometer.
10. Malus law Experiment**.**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Learning basic fundamentals in physical optics.	1.Demonstrating the basic information and principles through lectures and the achieved applications 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: a. board b. Power point c. e learning 4. Tutorials 5. Experimental learning 6. Discussions 7. Brain storming 8. Start each chapter by general idea and the benefit of it 9. To improve the student background of the subject 10. Show the best ways to deal with problem 11. Solving problems 12 Encourage the concept of team work 13- Logical thinking. 14- Active teaching 15- Self learning	1. Solve some example during the lecture. 2. Exams: a) Quizzes b) Short exams (mid-term exams) c) Long exams (final) d) Oral exams f) online quizzes 3. Discussions during the lectures. 4. Ask the student to clear the misunderstanding of some physical principle and asking about quality question. 5- Home work 6- Writing scientific paper 7- Doing team research or team project 8- Reports
1.2	Understanding the physics of superposition of waves, interference, diffraction, and polarization		
1.3	Using mathematical formula to describe the physical principle of diffraction and its relation with Fourier transform		
1.4	Capable of correcting the different types of lens aberrations		
1.5	Classifying the different types of interference techniques.		
2.0	**Skills**		
2.1	Apply the laws of physics to calculate some quantities concerning optics.	1. Preparing main outlines for teaching 2. Following some proofs 3. Define duties for each chapter 4. Home work assignments 5. Encourage the student to look for the information in different references 6. Ask the student to attend lectures for practice solving problem 7. Doing small research 8- Self learning 9-Project based learning 10- Report back sessions 11-Active learning	1. Midterm's exam. Exams, short quizzes 2. Asking about physical laws previously taught 3. Writing reports on selected parts of the course 4. team work projects
2.2	Solve problems optics course by using suitable mathematics.		
2.3	Analyse and interpret quantitative results.		
2.4	Apply physical principles of optics on day life phenomena.		
3.0	**Competence**		
3.1	Computation and Problem solving skill	1. Know the basic mathematical principles.	
3.2	Using technology and programs for solving the difficulties in physics		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.3	Data analysis and interpretation	2. Use the web for research. 3.Computational analysis. 4. Data representation. 5. Focusing on some real results and its physical meaning.	1. Their interaction with the lectures and discussions. 2. The reports using technology. 3. Homework, Problem solutions assignment and exams 4. Results of computations and analysis. 5. doing research using
3.4	Using technology in presentations		
3.5	Using technology in communications with others		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	5 %
2	Participation in activities lectures and labs	All weeks	5 %
3	Midterm Exam (theoretical)	8th week	30%
4	Lab. Reports (Practical)	11th week	5%
5	Final Exam (Practical)	15th week	15%
6	Final Exam (theoretical)	16th week	40%
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester. (6hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	*Introduction to Classical and Modern Optics, by Jurgen R. Meyer-Arendt, Prentic – Hall international , (1995). *Fundamentals of optics , by Francis Jenkins and Harvey White, Mc Graw Education, (2001)
Essential References Materials	
Electronic Materials	Websites on the internet that are relevant to the course topics

Other Learning Materials	Multimedia associated with the text book and the relevant websites

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	There are enough classrooms provided with a good accommodation, including good air condition, good Data show, suitable white board. There are enough laboratories for experimental physics, provided with air conditions, good data show, and experimental equipment.
Technology Resources (AV, data show, Smart Board, software, etc.)	In each class room and laboratories, there is a data show, and board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Each Class room and laboratories require a TV screen at least 65 inch-and smart, and double layer white board.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
• Course evaluation by student	Instructor	Direct oral communicatiom
• Students- faculty meetings	Group of students	communicatiom
• Peer consultation on teaching • Departmental council discussions • Discussions within the group of faculty teaching the course	Instructor	Oral test and quizzes
• Providing samples of all kinds of assessments in the departmental course portfolio of each course • Assigning group of faculty members teaching the same course to grade the same questions for various students.	Instructor	Exams
The course material and learning outcomes are periodically reviewed and the changes to be taken are approved in the departmental and higher councils. • The head of department and faculty take the responsibility of implementing the proposed changes in the course materials.	Instructor + The head of department	Course report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics Depratment, Faculty of Applied Science, Umm AlQura University
Reference No.	
Date	

Course Title:	**Modern physics**
Course Code:	**4-403350**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	**4**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 4/ 2nd year**
4. Pre-requisites for this course (if any)**:**	**Method in theoretical physics 1 code/ 403243-2**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	**45**
2	**Laboratory/Studio**	**42**
3	**Tutorial**	
4	**Others** (specify)	**8**
	Total	**95**
Other Learning Hours*		
1	**Study**	**45**
2	**Assignments**	**15**
3	**Library**	
4	**Projects/Research Essays/Theses**	**15**
5	**Others** (specify)	**15**
	Total	**90**

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course concern to by study the lows of physics phenomenas and their applications in physics. This course provides students a sufficient background on the basics of modern physics enabling students to take more courses that are advanced in physics.

2. Course Main Objective

For students undertaking this course, the aims are to:

1- **Understand** basics of the spatial theory of the relativity.
2- **Understand** the basic of the radiation of black body and objects.
3- **Use** the phase and group velocities.
5- **Realize** description of atom structure (Atomic models, Alpha-particle scattering, The Rutherford scattering formula, Nuclear dimensions, Electron orbits, Atomic spectra, The Bohr atom, Energy levels and spectra, Nuclear Motion, Atomic excitation, The correspondence Principle).
6- **Discuss** information about particles proprieties of waves
7- **Understand** the différents physics phenomena (The photoelectric effect, The quantum theory of light, X rays X-ray diffraction, The Compton effect, Pair production)
8- **Analyse** the UV catastrophe.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	**Define** the inertial reference frame, Galilean relativity, black body , UV catastrophe model of atomic structure.	K1-1.1
1.2	**Describe** De Broglie waves, Wave function, De Broglie wave velocity, The diffraction of particles, The uncertainty principle, Applications of the uncertainty principle, The wave-particle duality	K2-1.2
2	**Skills:**	
2.1	**Apply** physical principles on day life phenomena.	S1-2.1
2.2	**Derive** the physical laws and formulas related to (the modern physics laws, Bragg, Wien, DeBROGLIE, Compton, Heisemberg,,,,).	S2-2.2
2.3	**Analyse** the quantitative results.	S3-2.3
3	**Competence:**	
3.1	**Show** responsibility for self-learning to be aware with recent developments in physics.	C1-3.1
3.2	**write** scientific reports.	C2-3.2
3.3	**Work** effectively in groups.	C3-3.3
3.4	**Acquire** the skills to use the internet communicates tools.	C4-3.1

C. Course Content

No	List of Topics	Contact Hours
1	**THE SPATIAL THEORY OF THE RELATIVITY:** • Reference frame, inertial reference frame, Galilean relativity, • Einstein's postulate of relativity, relativity of the simultaneity, • Time dilatation, length contraction, Lorentz transformations, relativistic velocity transformations, • Relativistic mechanics, mass, energy, transformation of energy, momentum and force, • Doppler effect, Relativistic collisions, • Examples.	12
2	**PARTICLE PROPERTIES OF WAVES:** • The photoelectric effect, The quantum theory of light,	10

	• Radiation of heated objects, thermal radiation, cavity radiation treated with classical physics, • UV catastrophe, Planck's solution, quantum of energy, • The photoelectric effect, The quantum theory of light, • X rays X-ray diffraction, • The Compton effect, • Pair production, • Gravitational red shift**,** • Examples.	
3	**WAVE PROPERTIES OF PARTICLES:** • De Broglie waves, • Wave function, • De Broglie wave velocity, • Phase and group velocities, • The diffraction of particles, • The uncertainty principle, • Applications of the uncertainty principle, • The wave-particle duality, • Examples.	10
4	**ATOMIC STRUCTRUE:** • Atomic models, • Alpha-particle scattering, • The Rutherford scattering formula, • Nuclear dimensions, • Electron orbits, • Atomic spectra, • Energy levels and spectra, • Nuclear Motion, Atomic excitation, • The correspondence Principle) • Examples.	13
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	**Define** the physical quantities (Phase and group velocities, Energy levels and spectra, Time dilatation, length contraction,,,).	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: Board, Power point. 4. Discussions. 5. Brain storming. 6. Start each chapter by general idea and the benefit of it.	- Solve some example during the lecture. - Discussions during the lectures Exams: a) Quizzes, b) Short exams (mid-term exams), c) Long exams (final), d) Oral exams.
1.2	**Describe** the Wave function, photoelectric effect, Electron orbits and generalized lows using mathematics formula.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.0	**Skills**		
2.1	**Apply** physical principles on day life phenomena.	1. Preparing main outlines. 2. Following some proofs. 3. Define duties for each chapter. 4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem.	1. Exams (Midterm, final, quizzes), 2. Asking about physical, laws previously taught, 4. Discussions of how to simplify or analyze some phenomena.
2.2	**Derive** the physical laws and formulas related to physical phenomena.		
2.3	**Analyse** the quantitative results.		
3.0	**Competence**		
3.1	**Show** responsibility for self-learning to be aware with recent developments in physics.	Inform the students about the followings: 1. How to search the internet and use the library. 2. How to cover missed lectures. 3. How to summarize lectures or to collect materials of the course. 4. How to solve difficulties in learning : solving problems – enhance educational skills. 5. Give students tasks of duties. 6. How to write reports. 7. How to work as a teamwork. 8. How to lead a teamwork.	Evaluate the scientific reports, the team work, and evaluate the efforts of each student in preparing the report.
3.2	**write** scientific reports.		
3.3	**Work** effectively in groups.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Mediterm Exam 1	6^{th}	10%
2	Midterm Exam 2	12^{th}	10%
3	Experimental lab.	All weeks	20%
4	Exercieses & Homeworks	All weeks	10%
5	Final Exam	End of the semester	50%
	Total		**100%**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics department and timetable for academic advice were given to the student each semester. (2hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1-Jeremy Bernstein, Paul Fishbane and Stephen Gasiorowicz , Modern Physics, 2-Hardback (2000). 2-Randy Harris, Modern Physics (2nd Edition), International Edition 3-A. Beiser (2003). Concepts of Modern Physics (6th ed.). McGraw-Hill
Essential References Materials	• A. Beiser (2003). Concepts of Modern Physics (6th ed.). McGraw-Hill
Electronic Materials	- Web Sites, Social Media, Blackboard, etc.
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room for 45 students, Black (white) boards. • Library.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Class rooms provided with data show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching Strategies	Students	Questionaire
Effectiveness of student assessment	Instructor	Exams
Extent of achievement of course learning outcomes	Students	Questionaire
Quality of learning resources	Students	Questionaire

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics Department – College of Applied Science – Umm Al-Qura University
Reference No.	
Date	

Course Title:	**General Physics 3**
Course Code:	**4032122-3**
Program:	**BSc**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	
2. Course type	
a. University ☑ College ☑ Department ☑ Others ☐	
b. Required ☑ Elective ☐	
3. Level/year at which this course is offered: Level 4/2nd Year	
4. Pre-requisites for this course (if any)**: Electricity and magnetism (4032121-4)**	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	60
2	Laboratory/Studio	42
3	Tutorial	
4	Exams & Quizzes	8
	Total	80
Other Learning Hours*		
1	Study	35
2	Assignments	15
3	Library	
4	Projects/Research Essays/Theses	30
5	Exams & Quizzes	20
	Total	100

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of physics, such as measurements, work and energy, Newton's laws, heat, fluid mechanics, and light. This course will provide a conceptual and experimental background in physics sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

1. Define the main properties of an alternating current
2. Use the complex number
3. Understand the principle of basic components in AC circuit
4. Understand the concept of the electric power
5. Understand the theory of RC, RL, RLC circuits
6. Understand different types of filters (Low pass filter, High pass filter,…)

Understand the theory of the resonant circuit.

3.Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge:**	
1.1	Define the main properties of an alternating current	K1
1.2	Using the complex number	K1
1.3	Analyse the equations of R-C and R-C-L circuits and calculating the impedance, power factor, root-mean- square values of current and voltage.	K1
1.4	To use mathematical formulation to describe the physical principle or phenomena.	K3
1.5	Improving logical thinking.	K2
2	**Skills:**	
2.1	How to use physical laws and principles to understand the subject	S1
2.2	How to simplify problems and analyze phenomena	S2
2.3	Analyse and explain natural phenomena.	S2
2.4	Ability to explain the idea with the student own words.	S2
2.5	Represent the problems mathematically	S2
3	**Competence:**	
3.1	Write a report, Develop his English language, Think in solving problems, Search on the internet, Collect the material of the course, Deal with the lost lectures that he missed.	C1
3.2	The students should know how to do that independently and through discussions with the others	C2

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Principles of alternating current:** AC waveforms, frequency, Angular frequency, Period, Instantaneous value of the voltage, Maximum or peak value of the voltage, Initial phase, Root-Mean- Square (RMS) Values of Current and Voltage	2
2	❖ **Complex number:** Introduction, Vectors and AC waveforms, Simple vector addition, Complex vector addition, Polar and rectangular notation, Complex number arithmetic.	4
3	❖ **Passive components in AC circuit:** purely R, C ,L, Voltage, Current, Current leads Voltage	4
4	❖ **Power in AC circuit:** Power in resistive and reactive AC circuits, True, Reactive, and Apparent power, Calculating power factor	2
5	❖ **AC circuit analysis:** Reactance and impedance, RC circuit, RL circuit and series-parallel RLC circuits.	4
6	❖ **Filters:** Filter function , Low-pass filters, High-pass filters, Band-pass filters, Band-stop filters, Decibel, Bode plot,	4
7	❖ **Resonant circuits**: LC circuit, series- parallel RLC circuit, Quality factor,	4
8	❖ **AC bridges** : Maxwell's inductance bridge, Maxwell-Wien Bridge, Anderson Bridge, Hay's Bridge, Owen Bridge, De Sauty Bridge Shering bridge, Wien Series Bridge.	6
9		
Total		**30**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	1. Define the main properties of an alternating current	1. Demonstrating the basic information and principles through lectures and the achieved applications 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: a. Blackboard b. Power point c. e-learning 4. Tutorials 5. Revisit concepts 6. Discussions 7. Brain storming sessions	• Periodical exam and reports 10% • Mid- term (1 and 2) theoretical exams 30% • Mid-term practical exam 5% • Final practical exam 15% Final exam 40%
1.2	Using the complex number		
1.3	Analyse the equations of R-C and R-C-L circuits and calculating the impedance, power factor, root-mean- square values of current and voltage.		
1.4	To use mathematical formulation to describe the physical principle or phenomena.		
1.5	Improving logical thinking.		

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
		8. *Start* each chapter by general idea and the benefit of it; 9. Learn the student background of the subject; 10. Show the best ways to deal with problem; 11. Keep the question "why" or "how" to explain always there; Build a strategy to solve problem.	
2.0	**Skills**		
2.1	How to use physical laws and principles to understand the subject	2. Preparing main outlines for teaching 3. Following some proofs 4. Define duties for each chapter 5. Home work assignments 6. Encourage the student to look for the information in different references 7. Ask the student to attend lectures for practice solving problem Ask the student to do small research.	1. Midterm's exam. Exams, short quizzes 2. Asking about physical laws previously taught 3. Writing reports on selected parts of the course Discussions of how to simplify or analyze some phenomena.
2.2	How to simplify problems and analyze phenomena		
2.3	Analyse and explain natural phenomena.		
2.4	Ability to explain the idea with the student own words.		
2.5	Represent the problems mathematically		
3.0	**Competence**		
3.1	Write a report, Develop his English language, Think in solving problems, Search on the internet, Collect the material of the course, Deal with the lost lectures that he missed.	• Lab work • Active learning • Small group discussion	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific values of reports. • Evaluate the work in team • Evaluation of the role of each student in lab group assignment Evaluation of students presentations
3.2	The students should know how to do that independently and through discussions with the others		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Written Test (1)	6th week	10 %
3	Written Test (2)	11th week	10%
4	Lab. Reports (Practical)	All weeks	10%

#	Assessment task*	Week Due	Percentage of Total Assessment Score
5	Final practical exam	14th week	10%
6	Final Exam (theoretical)	16th week	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :
Each student will supervise by academic adviser in physics department and the time table for academic advice were given to the student each semester. (4hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Lessons In Electric Circuits, Volume II – AC. By Tony R. Kuphaldt.6 th Edition, 2007 Fundamental of Physics by Halliday & Resnick
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture room with at least 25 seats / labs with at least 16 benchs
Technology Resources (AV, data show, Smart Board, software, etc.)	Computer room containing at least 15 systems.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	•Availability of demonstrative materials relevant to the course material • Safety facilities

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
1. Following up the progress of students in the course.	instructor	Homework & quiz

Evaluation Areas/Issues	Evaluators	Evaluation Methods
2. Evaluating the progress of student	instructor	projects.
3. Evaluating the instructor.	student	questionnaires.
4. Revision of Exam paper	another staff member	Standers of the exam papers
5. Analysis the grades of students.	instructor	Gaussian distribution

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Theoretical Methods in Physics (2)**
Course Code:	**4033142-4**
Program:	**B.Sc in Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura university**

A. Course Identification

1. Credit hours:	**4 Hrs.**
2. Course type	
a.	University ☐ College ☐ Department ☒ Others ☐
b.	Required ☒ Elective ☐
3. Level/year at which this course is offered:	3rd year/ Level 5
4. Pre-requisites for this course (if any)**:**	Theoretical Methods in Physics (1) 4032141-4
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60 Hrs	80%
2	**Blended**	20 Hrs	20 %
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	60 Hrs
2	**Laboratory/Studio**	
3	**Tutorial**	40 Hrs
4	**Others** (specify)	
	Total	100 Hrs
Other Learning Hours*		
1	**Study**	60 Hrs/
2	**Assignments**	40 Hrs
3	**Library**	20 Hrs.
4	**Projects/Research Essays/Theses**	10 Hrs.
5	**Others** (specify)	
	Total	130 Hrs.

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The objective of this course is to learn in a practical manner the mathematical techniques and methods useful in physical sciences, not covered by previous courses (Theoretical Methods in Physics (1)**)**. The approach requires a combination of mathematics, skill in making legitimate approximations, and intelligent use of computers to get some motivation and verify the approximations. The course is designed to supply students for a variety of mathematical methods that need for advanced undergraduate and beginning graduate study in physical science and to develop a solid background for those who will continue into the mathematics of advanced theoretical physics.

2. Course Main Objective

This course is designed to supply students for a variety of mathematical methods that need for advanced undergraduate and beginning graduate study in physical science and to develop a solid background for those who will continue into the mathematics of advanced theoretical physics

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Work with Special functions	K1
1.2	Work with Legendre, Bessel, Hermite and Laguerre functions	K2
1.3	Solve partial differential Equations	K3
1.4	Work with complex variables	K2
2	**Skills:**	
2.1	Solve integrals using Special functions	S1
2.2	Generate functions and use of orthogonality relations	S2
2.3	Solve Laplace, Diffusion equations in different reference frames	S3
2.4	Evaluate integrals using complex variable techniques.	S1
3	**Competence:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**-Special functions:** Factorial Function, Gamma Function; Recursion Relation, Some Important Formulas Involving Gamma Functions, Beta Functions, Beta Functions in Terms of Gamma Functions, The Error Function, Asymptotic Series, Stirling's Formula, Elliptic Integrals and Functions	8
2	**-Legendre's functions:** Leibniz' Rule, Rodrigues' Formula, Generating Function, Orthogonality of the Legendre Polynomials, Normalization of the Legendre Polynomials, Legendre Series, Associated Legendre Functions, Generalized Power Series	10

3	**-Bessel's functions:** First and Second Solution of Bessel's Equation, Graphs and Zeros of Bessel Functions, Recursion Relations, Other Kinds of Bessel Functions, Orthogonality of Bessel Functions.	10
4	**-Hermite and Laguerre Functions:** Ladder operators, Hermite functions, Hermite polynomials, Laguerre functions, Laguerre polynomials, Associated Laguerre polynomials.	8
5	-Partial Differential Equations: Laplace's Equation; Steady-State Temperature in a Rectangular Plate, The Diffusion or Heat Flow Equation, The Wave Equation; the Vibrating String, Steady-state Temperature in a Cylinder, Steady-state Temperature in a Sphere, Poisson's Equation Integral Transform Solutions of Partial Differential Equations	12
6	**-Functions of a complex variable:** Analytic functions- Cauchy-Riemann conditions, Contour Integrals, Laurent Series, The residue theorem, Methods of finding the residues, Evaluation of Definite Integrals, Mapping.	12
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Outline the special functions..	Lectures and open discussions	Quizzes Oral exams Mid-term exams Assignments
1.2	Describe the importance of different special functions		
1.3	Define Legendre Polynomials, Hermit Polynomials, and Laguerre Polynomials.		
1.4	Know the Orthogonality relations of the special functions.		
1.5	Solve partial differential equations by the separation of variables technique		
1.6	Work with differentiation and integration of complex variables		
2.0	**Skills**		
2.1	Calculate integration using the definition of special functions..	Application of essential scientific techniques through lectures, classes and problem solving.	Homework problems
2.2	Use the orthogonality relations of Special functions		
2.3	- Work out with special functions that occur often in applications		
2.4	compute the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.5	prove the Cauchy Residue Theorem and use it to evaluate integrals		
3.0	**Competence**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	5 %
2	Participation in activities lectures	All weeks	5 %
3	First term exam	8th week	20 %
4	Second term exam	13th week	20 %
5	Final Exam	16th week	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1. Mary L. Boas, Mathematical methods in the Physical sciences, third edition, John Wiley and Sons (2006), ISBN-13 978-0-471-19826-0. 2. George B. Arfken, Hans J. Weber and Frank E. Harris, Mathematical Methods for Physicists (Seventh Edition), Elsevier (2012), ISBN: 978-0-12-384654-9. 3. G. Dennis Zill, R. Michael Cullen, Advanced engineering mathematics, Jones and Bartlett Publisher (2006), ISBN 9780763745912. 4. Eugene Butkov, Mathematical Physics, World student series edition (1973). 5. S. Grossman, Elementary Linear Algebra, 6th edition, Wadsworth (2006).
Essential References Materials	
Electronic Materials	

Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Class room is already provided with data show. • The area of class room is suitable concerning the number of enrolled students (68) and air conditioned. • Library.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Computer room. • MATLAB software.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Regular student's questionnaires	Student	Direct
Departmental review of the course	Faculty member	Direct
Correct sample from Exams and Homework's.	Faculty member	
Annual department review of course content and course specification	Faculty	Direct

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Classical Mechanics 1**
Course Code:	**4033143-4**
Program:	**BSc. Physics & BSc. Medical Physics**
Department:	**Physics**
College:	**Apllied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	
2. Course type	
a. University ☐ College ☐ Department ☑ Others ☐	
b. Required ☑ Elective ☐	
3. Level/year at which this course is offered: 3rd Year / Level 5	
4. Pre-requisites for this course (if any)**: General Physics (2) (4032101-4)**	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	60
2	Laboratory/Studio	
3	Tutorial	8
4	Others (specify)	
	Total	68
Other Learning Hours*		
1	Study	105
2	Assignments	15
3	Library	10
4	Projects/Research Essays/Theses	10
5	Others (specify)	
	Total	140

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

Chapter 1: A brief preparation in vector algebra and vector differentiation.
Chapter 2: Newton's laws of motion and the rectilinear motion of a single particle.
Chapter 3: Harmonic motion, damped and forced harmonic oscillator.
Chapter 4: The general motion of a particle in three dimensions.
Chapter 5: Noninertial reference systems.
Chapter 6: The central forces and celestial mechanics.
Chapter 7: Many-particle systems, collisions, and the rocket motion.

2. Course Main Objective

This course is designed to demonstrate and consolidate the basic physics concepts in classical mechanics, the general motion of the particles in three dimensions, the noninertial reference systems, the gravitation, central forces, and the dynamics of many-particle systems.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Define the physical quantities (vector quantities, scalar quantities, velocity, acceleration, force, linear momentum, angular momentum, work, Newton's law, simple harmonic motion, damped oscillation, Kepler's law, and center of mass).	K1
1.2	Describe the rectilinear motion, Newton's law of motion, damped harmonic motion, forced harmonic motion, the constrained motion of a particle, Kepler's laws of planetary motion, and motion of two interacting bodies using mathematics.	K1
2	**Skills:**	
2.1	Apply the laws of physics to calculate some quantities (energy equation of the orbit, periodic time of orbital motion, and center of mass of a system).	K2, S1
2.2	Solve problems related to the motion of a particle in a resisting medium, the motion in rotating coordinate system, and the motion in the central field by using suitable mathematics.	K2, S1
2.3	Analyze and interpret quantitative results.	S2
2.4	Apply physical principles on day life phenomena (vertical motion in air or through any fluid, effects of the earth's rotation, and Rocket motion).	S2
2.5	Derive the physical laws and formulas related to the motion of particle in rotating coordinate systems, the motion of particle in a central field, and the motion of two interacting bodies.	K2, S1
2.6	Show responsibility for self-learning to be aware with recent developments in physics	S3
2.7	Work effectively in groups and exercise leadership when appropriate.	S3
3	**Competence:**	
3.1	Communicate effectively in oral and written form.	C1
3.2	Collect and classify the material for the course.	C2
3.3	Use basic physics terminology in English	C3
3.4	Acquire the skills to use the internet communicates tools.	C3

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Fundamental Concepts Vectors** 29- Physical quantities and units. 30- Scalar and vector quantities. 31- Formal definition and rules.	8

	32- The Scalar and Vector Products. 33- Triple products 34- Derivative of a vector. 35- Position vector of a particle velocity and Acceleration in Rectangular Coordinates. 36- Velocity and Acceleration in Polar Coordinates. 37- Velocity and Acceleration in Cylindrical and Spherical Coordinates	
2	❖ **Newtonian Mechanics, Rectilinear Motion of a Particle** 1- Newton's Law of Motion. 2- Rectilinear Motion: Uniform Acceleration Under a Constant Force. 3- Forces that Depend on Position: The Concepts of Kinetic and Potential Energy. 4- Velocity-Dependent Forces: Fluid Resistance and Terminal Velocity.	12
3	❖ **Oscillations** 1- Linear Resoring Force: Harmonic Motion. 2- Energy Considerations in Harmonic Motion. 3- Damped Harmonic Motion. 4- Forced Harmonic Motion: Resonance.	8
4	❖ **General Motion of a Particle in Three Dimensions** 1- Introduction. 2- The Potential Energy Function in Three-Dimensional Motion: The Del Operator. 3- Forces of the Separable Type. 4- The Harmonic Oscillator in Two and Three Dimensions. Constrained Motion of a particle.	8
5	❖ **Noninertial Reference Systems** 1- Accelerated Coordinate Systems and Interial Forces. 2- Rotating Coordinate Systems. 3- Dynamics of a Particle in a Rotating Coordinate System. 4- Effects of Earth's Rotation. 5- The Foucault Pendulum.	8
6	❖ **Gravitation and Central Forces** 1- Introduction. 2- Gravitational Force between a Uniform Sphere and a Particle. 3- Kepler's Laws of Planetary Motion. 4- Kepler's Second Law: Equal Areas. 5- Kepler's Firs Law: The Law of Ellipses. 6- Kepler's Third Law: The Harmonic Law. 7- Potential Energy in a Gravitational Field: Gravitational Potential. 8- Potential Energy in a General Central Field. 9- Energy Equation of an Orbit in a Central Field. Orbital Energies in an Inverse-Square Field.	8
7	❖ **Dynamics of Systems of Particles** 1- Introduction, Center of mass and linear momentum of a system. 2- Angular momentum and kinetic energy of a system. 3- Motion of two interacting bodies: the reduced mass. 4- Collisions. 5- Oblique collisions and scattering: comparison of laboratory and center of mass coordinates. 6- Motion of a body with variable mass: rocket motion.	8
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Define the physical quantities (vector quantities, scalar quantities, velocity, acceleration, force, linear momentum, angular momentum, work, Newton's law, simple harmonic motion, damped oscillation, Kepler's law, and center of mass).	1. Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: Board, Power point. 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Discussions during the lectures Exams: a) Quizzes (E-learning) b) Short exams (mid-term exams) c) Long exams (final) d) Oral exams .
1.2	Describe the rectilinear motion, Newton's law of motion, damped harmonic motion, forced harmonic motion, the constrained motion of a particle, Kepler's laws of planetary motion, and motion of two interacting bodies using mathematics.		
2.0	**Skills**		
2.1	Apply the laws of physics to calculate some quantities (energy equation of the orbit, periodic time of orbital motion, and center of mass of a system).	1. Preparing main outlines for teaching. 2. Following some proofs. 3. Define duties for each chapter 4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem.	1. Exams (Midterm, final, quizzes) 2. Asking about physical laws previously taught 3. Writing reports on selected parts of the course. 4. Discussions of how to simplify or analyze some phenomena
2.2	Solve problems related to the motion of a particle in a resisting medium, the motion in rotating coordinate system, and the motion in the central field by using suitable mathematics.		
2.3	Analyze and interpret quantitative results.		
2.4	Apply physical principles on day life phenomena (vertical motion in air or through any fluid, effects of the earth's rotation, and Rocket motion).		
2.5	Derive the physical laws and formulas related to the motion of particle in rotating coordinate systems, the motion of particle in a central field, and the motion of two interacting bodies.		
2.6	Show responsibility for self-learning to be aware with recent developments in physics	• Search through the internet and the library. • Small group discussion. • Enhance self-learning skills. • Develop their interest in Science through : • (lab work, visits to scientific and research institutes).	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific reports. • Evaluate the team work in lab and small groups. • Evaluation of students presentations.
2.7	Work effectively in groups and exercise leadership when appropriate.		
3.0	**Competence**		
3.1	Communicate effectively in oral and written form.	1. Incorporating the use and utilization of computer, software, network and multimedia through courses 2. preparing a report on some topics related to the course depending on web sites	1. Evaluating the scientific reports. 2. Evaluating activities and homework
3.2	Collect and classify the material for the course.		
3.3	Use basic physics terminology in English.		
3.4	Acquire the skills to use the internet communicates tools.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	5 %
3	In-Class Problem solving	All weeks	5 %
4	Midterm Exam1 (theoretical)	7th week	20%
5	Midterm Exam2 (theoretical)	13th week	20%
6	Final Exam (theoretical)	16th week	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by an academic adviser in physics Department and the time table for academic advice were given to the student each semester. (4 hours per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	G. R. Fowles and G. L. Cassiday, "Analytical Mechanics", 7th edition, Brooks Cole (2005). G. R. Fowles, "Analytical Mechanics", 3rd edition, Holt, Rinehart and Winston (1977).
Essential References Materials	
Electronic Materials	
Other Learning Materials	S. T. Thornton, and J. B. Marion, "Classical Dynamics of Particles and Systems", 5th edition, Brooks Cole (2003).

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom for 40 students with data show Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Computer room Data show
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Each Classroom data show, and double layer white board.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
6. Following up the progress of students in the course.	instructor	Homework & quiz
7. Evaluating the progress of student	instructor	projects.
8. Evaluating the instructor.	student	questionnaires.
9. Revision of Exam paper	another staff member	Standers of the exam papers
10. Analysis the grades of students.	instructor	Gaussian distribution

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	Quantum Mechanics 1
Course Code:	**4033145-4**
Program:	**37**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:
2. Course type **a.** University [√] College [ ] Department [ ] Others [ ] **b.** Required [√] Elective [ ]
3. Level/year at which this course is offered: 5th level / 3rd year
4. Pre-requisites for this course (if any)**:** Theoretical Methods in Physics 1(4032141-4) Linear Algebra (suggestion)
5. Co-requisites for this course (if any)**:** Theoretical Methods in Physics 2 (4033142-4)

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	60	100%
2	**Blended**	-	-
3	**E-learning**	√	-
4	**Correspondence**	-	-
5	**Other (WhatsApp)**	√	

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	60
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify) Exams/ Quizzes	8
	Total	68
Other Learning Hours*		
1	**Study**	105
2	**Assignments**	15
3	**Library**	-
4	**Projects/Research Essays/Theses**	-
5	**Others** (specify) Exams/Quizzes	20
	Total	140

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description
2. Course Main Objective

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	The idea of the evolution of quantum mechanics using the concept of probability.	K1
1.2	Evolution of wavefunction with different potentials, concept of eigenvalue and eigenfunction, concept of tunneling,	K2
1.3	Energy and wavefuction of Hydrogen atom in spherical coordinates and other properties like angular momentum and spin.	K3
2	**Skills:**	
2.1	Ability to understand the situation	S1
2.2	Ability to use the correct of relavant mathematical too.	S2
3	**Competence:**	
3.1	.	
3.2	Knowledge about the relevant work going on around the world	C2

C. Course Content

No	List of Topics	Contact Hours
1	**Wave Particle duality, Probability and Schrodinger Equation** ▪ Radiation as particles, electrons as waves ▪ Plane waves and wavepackets ▪ The probability interpretation of the wavefunction ▪ The Schrodinger equation ▪ The Heisenberg uncertainty relation ▪ The probability current ▪ Expectation values and the momentum in wave mechanics, wavefunction in momentum space	8
2	particle **Eigenvalues , Eigenfunctions and the Expansion Postulate** ▪ The time-independent Schrodinger equation, ▪ Eigenvalue equation ▪ The eigenvalue problem for a particle in a box ▪ The expansion postulate and its physical interpretation ▪ Momentum eigenfunctions and the free particle, Normalization of the free wavefunction, Degeneracy ▪ Parity	8
3	**One-dimensional potential field** ▪ The potential step ▪ The potential wall ▪ The potential barrier ▪ An example of tunnelling ▪ Bound states in a potential well	8

	▪ The harmonic oscillator	
4	**The General Structure of Wave Mechanics** ▪ The eigenfunctions and eigenvalues, The Hamiltonian operator ▪ Other observables ▪ Vector spaces and operators ▪ Degeneracy and simultaneous observables ▪ The time dependence and the classical limit	8
5	**Angular Momentum** ▪ The angular momentum commutation relations ▪ Raising and lowering operatorsfor angular momentum ▪ Representation of |**l, m** > states in spherical coordinates.	4
6	**The Schrodinger Equation in Three Dimensions and Hydrogen Atom** ▪ The central potential ▪ The Hydrogen atom ▪ The energy spectrum ▪ The free particle	8
7	**Spin** ▪ Eigenstates of spin ½ ▪ The intrinsic magnetic moment of spin ½ particles ▪ Addition of two spins ▪ The addition of spin ½ and orbital angular momenta ▪ General rules for addition of angular momenta	8
8	**Matrix Repesentation of Operators** ▪ Matrices in quantum mechanics ▪ Matrix representation of angular momentum operators ▪ General relations in matrix mechanics ▪ Matrix representation of spin 1/2	8
Total		60

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1		Stress on clearing the concept by relating examples	In-class questioning and discussion
1.2		Update the students by the relevant research, going on internationally relating to the topics under study.	Small project
…		Stress on discussion during the lecture	
2.0	**Skills**		
2.1	Control over using the mathematical tools	Telling different ways to handle a situation	
2.2	Problem solving	Assignments, In-class tuitorials	Quiz, Midterm Exams, Final Exams

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.3	Using the correct approach	Relating the situations to the real world as much as possible	
3.0	**Competence**		
3.1	Knowledge about the relevant work going on around the world	Giving the information of relted international new research during lectures.	
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments	Every week	10
2	Quizzes	14th week	5
3	Midterm Exams	7th and 12th week	30
4	Questioning during lectures	Every week	5
5	Final exam	16th week	50

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

4 hours per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	S. Gasiorowicz, 'Quantum Mechanics', *John Wiley & Sons, Inc.*, 3rd Ed.
Essential References Materials	David J. Griffiths, 'Introduction to Quantum Mechanics', *Pearson Prentice Hall, USA.*
Electronic Materials	https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/lecture-videos/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom with a good whiteboard
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	--

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
This same course is taught to Medical physics students. Medical physics students don't have enough background for this course.	Incharge Medical Physics	For the remedy to this problem it is suggested that Linear Algebra should also be a pre-requisite for this course in addition to Theoretical Methods in Physics 1. Or Medical physics students should have a different course structure for Quantum Mechanics 1.
Students who do not take the course on Theoretical Methods 2 in the same semester, remain unfamiliar with many special functions like Bessel function, Leguerre function, error function etc., that are used in the course.	Faculty member teaching the course	It is suggested that Theretical Methods 2 should be a co-requisite of Quantum Mechanics 1.
Exam papers	Other faculty members	Direct peer review

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Heat and Thermodynamics**
Course Code:	**4033110-3**
Program:	**B.Sc Physics**
Department:	**Physics**
College:	**Applied science**
Institution:	**Umm AL-Qura University**

A. Course Identification

1. Credit hours: **3**
2. Course type **a.** University ☐ College ☐ Department √ Others ☐ **b.** Required √ Elective ☐
3. Level/year at which this course is offered: 5th
4. Pre-requisites for this course (if any)**: General physics (2)-4032102-4**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	3	100%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	3 x 15
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	45
Other Learning Hours*		
1	**Study**	
2	**Assignments**	
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (specify)	
	Total	

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

In this course, chapter1: presents the basic concepts of heat and the general principles related to it. Chapter 2: introduces the Kinetic theory of gases and basic concepts related to that. Chapter: 3 shows the first law of thermodynamics, types of systems and thermodynamic processes. Chapter 4: introduce the second law of thermodynamics, heat engines and pumps. Chapter 5: explain the concept of entropy, the change in entropy in the reversible processes, the third law of thermodynamics. chapter 6: introduce thermodynamics potentials, internal energy U, enthalpy (H), free energy of Gibbs (G) and Helmholtz free energy (A), Maxwell relations and their the application, Tds equations, Clausiuos Claperyron equation.

2. Course Main Objective

The course provides the basic concepts in the heat and thermodynamics including basic definitions and laws relating to them and their applications.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Knowledge basic information and principles In heat and thermodynamics	K1
1.2	Recognize the laws of thermodynamics and its applications in different fields	K2
1.3		
1...		
2	**Skills:**	
2.1	Solve problems in thermodynamics by using suitable laws	S1
2.2	Analyze and interpret quantitative results	S2
2.3		
2...		
3	**Competence:**	
3.1	-Learn how to search the internet and use the library. -Learn how to cover missed lectures. -Learn how to summarize lectures or to collect materials of the course. -Learn how to solve difficulties in learning: solving problems – enhance educational skills. -Develop student' interest in Science through :(lab work, field trips, visits to scientific and research. -Encourage the student to attend lectures regularly by: Giving bonus marks for attendance Assigning marks for attendance	C1
3.2	Employ software skills	C2
3.3	Acquire the skills to use the internet communicates tools	C3
3...		

C. Course Content

No	List of Topics	Contact Hours

1	**1. Thermal properties of matter:** Temperature and Heat, Temperature scales, Type of thermometer, Zero law of Thermodynamic, Thermal transfers, thermal expansion	8
2	**2. Thermodynamics properties:** equation of ideal gas, kinetic theory, Van der Waal equation for real gas, Deducation of the critical constant of a real gas of Van der Waal, Virial equation of state, Reduced equation of state, adiabatic compressibility, P-V-T relationship of real gases, Phase Diagram	8
3	3. **First law of thermodynamics, Heat and Energy**: The types of systems and the processing in thermodynamics, the definition of heat capacity and specific heat capacity, latent heat, apply the first law of thermodynamics to evaluate the temperature and work and the internal energy and energy conversion, explain the enthalpy, the relationship between specific heat for gas, the work done in adiabatic process.	8
4	**4. Second law of thermodynamics:** heat engines, refrigerators, and heat pumps, reversible processes, statements of Kelvin - Planck and Clausius. Carnot machine and its efficiency, and examine the principles of the Carnot cycle, and efficiency of Otto cycle and diesel fuel and gasoline	7
5	**5.Entropy and third law of thermodynamics:** explain the concept of entropy, the change in entropy in the reversible processes, explain the third law of thermodynamics	7
6	6.**Thermodynamics potentials**: thermodynamics potentials, internal energy U, enthalpy (H), free energy of Gibbs (G) and Helmholtz free energy (A), Maxwell relations and their the application, Tds equations, Clausiuos Claperyron equation.	7
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Knowledge basic information and principles In heat and thermodynamics	1. Demonstrating the basic information and principles through lectures. 2. Lecturing method: Board,(b) Power point. 3. Discussions Brain storming. Start each chapter by general idea and the benefit of it;	1.Quizzes, midterm, and final exams. 2. Homeworks

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Recognize the laws of thermodynamics and its applications in different fields	1. Demonstrating the basic information and principles through lectures. 2. Lecturing method: Board, Power point. 3. Discussions 4. Brain storming.	1. Quizzes, midterm, and final exams. 1. .Homework.
…			
2.0	**Skills**		
2.1	Solve problems in thermodynamics by using suitable laws	1. Following some proofs. 2. Define duties for each chapter. 3. Homework assignments. Encourage the student to look for the information in different references	2. Exams 3. Short quizzes. 4. Team work projects. Solving problems.
2.2	Analyze and interpret quantitative results	1. Group discussions.	1. Exams 2. Short quizzes. 3. Asking about physical laws previously taught. 4. Team work projects. Solving problems
…			
3.0	**Competence**		
3.1	-Learn how to search the internet and use the library. -Learn how to cover missed lectures. -Learn how to summarize lectures or to collect materials of the course. -Learn how to solve difficulties in learning: solving problems – enhance educational skills. -Develop student' interest in Science through :(lab work, field trips, visits to scientific and research. -Encourage the student to attend lectures regularly by: Giving bonus marks for attendance Assigning marks for attendance	1. Group discussion. 2. Cooperative learning. 3. Solving problems.	1. Discussion. 2. Homework. Reports.
3.2	Employ software skills	1. Computational analysis. 2. Data representation. Focusing on some real results and its physical meaning.	1. Results of computations and analysis. 2. Homework.
3.3	Acquire the skills to use the internet communicates tools		1. Reports. 2. Projects.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Home works and quizes	All weeks	10 %
2	Midterm 1	6th week	20 %

#	Assessment task*	Week Due	Percentage of Total Assessment Score
3	Midterm 2	13th week	20%
4	Final Exam	16th week	50%
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

4 office hours per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**1. List Required Textbooks** 1. Daniel V. Shroeder, An Introduction to Thermal Physics, Addison-Wesley Publishing Company, San Francisco, CA, 1999, The ISBN is 0-201-38027-7. 2. Physics for Scientists and Engineers, 6th Edn. (R.A.Serway, J.W.Jewett, Thomson 2004, ISBN 053440 3. Giancoli- Physics (6th)
Essential References Materials	**(Journals, Reports**, etc.)
Electronic Materials	**Web Sites**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room for 40 students, with data show. • Library
Technology Resources (AV, data show, Smart Board, software, etc.)	• (AV, data show, Smart Board, software, etc.) • data show + Board
Other Resources	(NA)

Item	Resources
(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course	students	questionnaires
learning outcomes	Program leader	Exam-questionnaires
Quality of learning resources	students	questionnaires
Evaluating the progress of student by projects	Instructor	exam

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	**Pysics department**
Reference No.	
Date	**22/11/2019**

Course Title:	**Electromagnetism 1**
Course Code:	**4033132-3**
Program:	**Physics**
Department:	**Physics department**
College:	**Applied science**
Institution:	**Umm AL – Qura University**

A. Course Identification

1. Credit hours:	**3**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**3nd Year / Level 6**
4. Pre-requisites for this course (if any)**:**	**Classical Physics (403200-4)**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	42	100%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	**45**
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (exam and quizzes)	8
	Total	
Other Learning Hours*		**53**
1	**Study**	**65**
2	**Assignments**	**15**
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (exam and quizzes)	20
	Total	**153**

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course deals primarily with a vector calculus based description of static electric field in case of fixed charges, volume and surface charge distribution, dipole, multipole, conductor and dielectric beside the calculation of the electrostatic potentials in each case. The calculation of the electric field by applying Gauss's law for fixed charges and dielectric materials. Also, it concerns the study of the polarization, dielectric constant and the boundary conditions at the interface at the two different dielectric media. The calculation of molecular fields, electrostatic energy and the description of moving charges and steady electric currents are also presented.

2. Course Main Objective

Describe, in words, the ways in which various concepts in electromagnetism come into play in particular situations; to represent these electromagnetic phenomena and fields mathematically in those situations; and to predict outcomes in other similar situations.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Define the quantity of electrostatic field and electric flux	K1
1.2	Describe the concepts and theoretical in the electrostatic	K2
1.3	Identify the new research and application	K3
1...		
2	**Skills:**	
2.1	Apply the theoretical laws and principles relevant to electrostatic	S1
2.2	Analyze the different formation and sources of electrostatic.	S2
2.3	Demonstrate a reasoned argument to simplify problems and analyze phenomena in electrostatic	S2
2-4	Critically assess, evaluate, explain the idea with the student own words, identify, formulate and solve the electrostatic represent the problems mathematically	S3
3	**Competence:**	
3.1	Plan, design, record, execute and communicate a piece of independent research in electrostatic	C1
3.2	Respond to the change of electromagnetic information and analyses electrostatic data	C2
3.3	Computation and problem solving	C3
3-4	Data analysis and interpretation and feeling physical reality of results	C2

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Electrostatics:** 1-Electric Charge 2-Coulomb's law 3-The Electric Field 4-Electrostatic Potential 5-Conductors & Insulators 6-Gauss's Law 7-The Electric Dipole	6

2	❖ **Solution of electrostatic problems:** 1-Poisson's Equation 2-Laplace's Equation 3-Laplaces's Equation in one independent Variable 4-Laplace's Equation in Spherical Coordinates 5-Conducting Sphere in Uniform 6-Cylindrical Harmonics 7-Electrostatic Images 8-Point charge & Conducting Sphere 9-Line charges & Line Images 10-System of Conductors	**15**
3	**The Electrostatic Field in Dielectric Media** 1-Polarization 2-Field Outside of a Dielectric Medium 3-The Electric Field inside a Dielectric 4-The Electric Displacement 5-Electric Susceptibility and Dielectric Constant 6-Point Charge in a Dielectric Field 7-Boundary Conditions on the Field Vector 8-Boundary Value Problem Involving Dielectrics	**9**
4	**Electrostatic Energy** 1-Potential Energy of a Group of Point Charges 2-Energy Density of an Electrostatic Field 3-Energy of a System of Charged Conductors 4-Capacitors.	**6**
5	**Electric Current** 1-Current Density & Equation of Continuity 2-Ohm's Law 3-Steady Currents in continuous Media 4-Microscopic Theory of Conduction.	**6**
...		
Total		**42**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Define the quantity of electrostatic field and electric flux	* The methodology of teaching that includes a curriculumdesign, planning and delivering teaching and assessment, combination of lectures and web-interactions by the lecturer. These will give	Periodical quizzes, assignments and homework First and second mid- term exam and final exam
1.2	Describe the concepts and theoretical in the electrostatic		
1-3	Identify the new research and application		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		*The opportunity of students to understand the basic science of the electromagnetic and its different applications in life. *Effective by solve some examples during the lecture Small group teaching and assessment learning. *Teaching for reflective learning and research methods. *Seminar presentation and on-line learning process with (images and movies) *Collect the new information about what the new in electromagnetic	Emphasis of the students in the presence of the lecture continuously Making the students are working small projects and report for electromagnetically and its applications around us. Ask the student to clear the miss understanding of the course
2.0	**Skills**		
2.1	Analyze the different formation and sources of electrostatic.	Preparing main outlines for teaching in the starting of the lecture Define tasks for each chapter Open discussions during the lectures Brain storming, group work, homework assignments and small project Encourage the student to look for the information in different sources	All exams and short quizzes . Asking the students about physical meaning and laws previously taught writing reports on selected parts of the course Discussions of how to simplify or analyses after the lecture
2.2	Apply the theoretical laws and principles relevant to electrostatic		
2-3	Demonstrate a reasoned argument to simplify problems and analyze phenomena in electrostatic		
3.0	**Competence**		
3.1	Plan, design, record, execute and communicate a piece of independent research in electrostatic	Learn how to search the internet and use the library Teamwork and small group discussion Interactive learning Homework (preparing a report on some topics	Quizzes Checking report and evaluate the efforts and scientific values of each student in preparing report.
3.2	Respond to the change of electromagnetic information and analyses electrostatic data		
3-3	Computation and problem solving		
3-4	Data analysis and interpretation and feeling physical reality of results		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		related to the course depending on web sites). Seminars presentation	Their interaction with the lectures and discussions Evaluation of presentation Oral discussion

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	5 %
2	Participation in activities lectures	All weeks	5%
3	First Exam (theoretical)	7th week	20%
4	second Exam (theoretical)	13th week	20%
5	Final Exam (theoretical)	16th week	50%

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E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will be supervised by academic adviser in physics Department and the time table for academic advice were given to the student each semester. (2 hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Introduction to Electrodynamics by David J. Griffiths, [Prentice-Hall, Inc., 1999], 3rd Edition.
Essential References Materials	• Foundations of Electromagnetic Theory by Reitz, John R., Milford, Frederick J., Christy, Robert W. [Addison-Wesley, 2008] 4th Edition • Electromagnetic Fields and Waves by Paul Lorrain, Dale R. Corson, Francois Lorrain [W. H. Freeman and Company, 1988] 3rd Edition
Electronic Materials	https://www.khanacademy.org/science/physics
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	There are enough classrooms provided with a good accommodation, including good air condition, good Data show, suitable white board. There are enough laboratories for experimental physics, provided with air conditions, good data show, and experimental equipment.
Technology Resources (AV, data show, Smart Board, software, etc.)	In each class room and laboratories, there is a data show, and board.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Each Class room and laboratories require a TV screen at least 65 inch-and smart, and double layer white board.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Strategies for Obtaining Student Feedback on Effectiveness of Teaching	Student	• Course reports • Course evaluation.
Other Strategies for Evaluation of Teaching by the Instructor or by the Department	Program leader	• Revision of student answer paper by another staff member. • Analysis the grades of students.
Processes for Improvement of Teaching	Department	• Preparing the course as PPT. • Using scientific flash and movies. • Coupling the theoretical part with laboratory part • Periodical revision of course content.
Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)	Peer reviewers	• The instructors of the course are checking together and put a unique process of evaluation. • Check marking of a sample of papers by others in the department. • Feedback evaluation of teaching from

Evaluation Areas/Issues	Evaluators	Evaluation Methods
		independent organization. • Independent evaluation by another instructor that give the same course in another faculty. • Evaluation by the accreditation committee in the university.
Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement	Program leaders and peer reviwers	1- The following points may help to get the course effectiveness • Student evaluation • Course report • Program report • Program Self study 2- According to point 1 the plan of improvement should be given.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Quantum Mechanics 2**
Course Code:	**4033146-3**
Program:	**BSc Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	**3H**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 6/3rd Year**
4. Pre-requisites for this course (if any)**:**	**Quantum Mechanics (1) (4033145-4)**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	41	90%
2	**Blended**	4	10%
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	0
3	**Tutorial**	
4	**Others** (specify) Exams & Quizzes	8
	Total	53
Other Learning Hours*		
1	**Study**	90
2	**Assignments**	15
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (specify) Exams & Quizzes	20
	Total	125

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course covers the theoretical basis of quantum physics. It introduces the approximation methods like the perturbation theory, the variational method, the WKB approximation, the partial wave analysis and the Born approximation. Beside some physical effects that come out of the experiments.

It is the second course in the undergraduate Quantum Physics sequence.

2. Course Main Objective

At the end of this course, student should be able to:

- Construct the spin matrices.
- Fulfilment operation of addition of angular momenta and spin.
- Calculate the commutation relations of angular momentum.
- Explain the motion of charged particle of spin 1/2 in magnetic field.
- Writing the Hamiltonian with taking the energy corrections into account.
- Find the ground state of energy by variational principle.
- Obtain the approximate solutions to the time independent Schrodinger equation by the WKB approximation.
- Apply the time-independent (-dependent) perturbation theory on different system.
- Calculate the scattering amplitude by two techniqes.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Demonstrate the fundamental principles and concepts of core knowledge of quantum physics.	K1
1.2	Associate the mathematical concepts to a proper understanding of quantum physics phenomena proficiently	K2
1.3	Explore quantum physical phenomena by approximate methods and analytically, collecting and analyzing theoretical data, and interpreting their results.	K3
2	**Skills:**	
2.1	Apply the scientific method to design, execute, and analyze a physical problem ortheoretical data.	S1
2.2	Explain scientific theoretical manipulation procedures.	S2
2.3	Communicate quantum physics concepts, methods, and results effectively, both verbally and in writing.	S3
3	**Competence:**	
3.1	Participate effectively in multidisciplinary and/or interdisciplinary teams	C1
3.2	Be able to self-learn in quantum physics-related topics.	C2
3.3	Manage a project (modelling or simulation) with due attention to time and resource management	C3

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Review of Quantum Mechanics 1**	6

	• Postulates. • Wave Mechanics and Schrodinger's Equation. • Operator Methods. • Bound and Unbound states in one-dimension. • Quantum Mechanics in more than one-dimension. • Matrix Mechanics. • Angular Momentum, Commutation Relations. • Spin; Spin Representation and Pauli matrices. Addition of angular Momenta and spin.	
2	❖ **Time –Independent Perturbation Theory** • Perturbation Series; First and Second Order Expansion. • Degenerate Perturbation Theory. • The Fine Structure of Hydrogen. • The Stark Effect. • The Zeeman Effect.	9
3	❖ **Variational Principle** • Theory • The Ground State of Helium.	6
4	❖ **The WKB Approximation** • The Classical Region. • Tunneling.	3
5	❖ **Time-Dependent Perturbation Theory** • Two- Level Systems: The Perturbed System, Time-Dependent Perturbation Theory, Sinusoidal Perturbations. • Emission and Absorption of Radiation, Absorption, Stimulated Emission, and Spontaneous Emission, Incoheret Perturbations. Spontaneous Emission: Einstein's A and B coefficients, The Lifetime of an Excited State, Selection Rules.	12
6	❖ **Scattering** • Introduction. • Partial Wave Analysis. The Born Approximation	9
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Recognize the matrix representation and operator method in quantum mechanics.	•Discussions •Brain storming •Lecturing method: Board, PPT, pictures and diagrams	• Quizzes (E-learning) • Short exams (mid- term exams) • Long exams (final) • Oral exams • Discussions during the lectures.
1.2	Define the princples and quantities in quantum mechanics, like spin, Zeeman effect, Variational principle, scattering amplitude and life time.		
1.3	Describe the motion of charged particle of spin 1/2 in both uiform and inhomogeneouse magnetic field.		
1.4	List the different methods to obtain the approximate solutions to the time independent Schrodinger equation.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.5	Outline the different types of energy corrections in Hydrogyn atom.		
2.0	**Skills**		
2.1	The ability to Construct the spin matrices.	• Show the best ways to deal with the problem. • Keep the question "why" or "how" in explaination. • Training the student to solve the greatest number of issues	• Quizzes (E-learning) • Short exams (mid- term exams) • Long exams (final) • Oral exams • Reports about analyze results of some phenomena
2.2	The ability to addition of angular momentum and spin properly.		
2.3	Calculate the Clebsh-Gordan coefficients by different ways.		
2.4	Conclude the equations describing the motion of electron (s=1/2) in magnetic field and analyse the resuls.		
2.5	Write the Hamiltonian of Hydroge atom by taking the correction into account.		
2.6	Apply the time-independent perturbation theory to find the wave function and energy state (first and second order expantion).		
2.7	Apply the time-independent perturbation theory to find the wave function and energy (degenerate and non degenerate states).		
2.8	Find the ground state of energy by variational principle for different systems.		
2.9	Calculate the energy corrections correctly; fine structure, Zeeman effect and hyperfine structure.		
2.10	Calculate the approximate solutions of Schrodenger equation by WKB approximation.		
2.11	Explain the tunnelling phenomenon mathematically.		
2.12	Calculate the transition probability and life time by applying time-dependent perturbation theory.		
2.13	Conclude and apply the selection rules of transition between the states.		
2.14	Calculate the scattering amplitude by two teqniqes:partial wave analysis and Bore approximation.		
3.0	**Competence**		
3.1	The ability to take responsibility and take the course instructions seriously	• Groupe assigments • Clarify deadlines for delivery of assignments, reports and exams	• Evaluate the efforts of each student in preparing the report. • Evaluate the work in teams Evaluation of students presentations
3.2	The ability to be an effective member of the working group		
3.3	Accept different nationalities and respect other opinions		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Midterm 1 (theoretical)	6th week	20%
3	Midterm 2 (theoretical)	10th week	20%
4	Final Exam (theoretical)	16th week	50%
5			
6			
7			

#	Assessment task*	Week Due	Percentage of Total Assessment Score
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- The time table for each teacher were available to the student each semester.
- Fix 4 office houers per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• David J. Griffiths ”Introduction to Quantum Mechanics”, Pearson Prentice Hall, New York, Second edition (2017).
Essential References Materials	• Massiah, Quantum Mechanics, 6th prn. (John Wiley & Sons, Inc., NY, London, Sydney, 1965). Physics , 4th edition, By: J. Walker (2014) • Nouredine Zettili, "Quantum Mechanics: Concepts and Applications", John Wiley & Sons, Inc. second edition (2009).
Electronic Materials	https:www.coursera.org
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classroom • Library • Student Lounge Computer lab
Technology Resources (AV, data show, Smart Board, software, etc.)	• Computer lab • Data show High speed network connection
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Analysis the grades of students. Use modern method of learning (e.g. data show, PPT, movies, e-learning,...) Link the course to the life application. • The instructors of the course are checking together and put a unique process of evaluation.	The instructors of the course • Check marking of a sample of papers by others in the department. • Feedback evaluation of teaching from independent organization. • Independent evaluation by another instructor that give the same course in another faculty. • Evaluation by the accreditation committee in the university.	• Student evaluation • Course report • Program report • Program Self study

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Statistical Thermodynamics**
Course Code:	**4033111-3**
Program:	**B.Sc Physics**
Department:	**Physics**
College:	**Applied science**
Institution:	**Umm AL-Qura University**

A. Course Identification

1. Credit hours: **3**
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: **6th**
4. Pre-requisites for this course (if any)**: Heat and Thermodynamics (4033110-3)**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	3	100%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	3 x 15
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	45
Other Learning Hours*		
1	**Study**	
2	**Assignments**	
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (specify)	
	Total	

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will give the new mathematical treatment in the concept of probability for some physical quantities for a system consists of a large number of particles such as a monatomic or diatomic ideal gas or steam of electrons or quantity of photons radiated from black body radiation. These quantities are given according to classical or quantum treatment.

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2. Course Main Objective

1. Realize the difference between the energy levels and energy states.
2. Define the concept of the thermodynamic probability and how to deal with some physical applications through this concept.
3. Differentiate between distinguishable and indistinguishable particles.
4. Compare between the different distribution functions and the different cases in use every one.
5. Define the concept of the partition function and redefine the thermodynamic quantities in terms of the partition function.
6. apply some statistics and some quantum statistics to the systems.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Understand and apply the principles of statistical mechanics on ensembles of molecules.	K1
1.2	Understand and apply the principles of statistical mechanics on ensembles of molecules	K2
1.3		
1...		
2	**Skills:**	
2.1	Apply the laws of physics.	S1
2.2	Solve problems in Physics by using suitable mathematical principles	S2
2.3	Analyse and interpret quantitative results	
2.4	Express the physical phenomena mathematically.	
3	**Competence:**	
3.1	Show responsibility for self-learning to be aware with recent developments in physics	C1
3.2	Work effectively in groups and exercise leadership when appropriate.	C2
3.3	Acquire the skills to use the internet communicates tools	C3
3...		

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Introduction:** **-Energy states and energy levels, macro states and microstates, thermodynamic probability.**	8
2	**The three statistics and its distribution functions:**	8

	❖ **-The Bose-Einstein statistics, the Fermi-Dirac statistics , the Maxwell-Boltzmann statistics, The statistical interpretation of entropy, The Bose-Einstein distribution function, the Fermi-Dirac distribution functions, the classical distribution function, comparison of distribution functions for indistinguishable particles, the Maxwell-Boltzmann distribution function.**	
3	❖ **The partition function:** **Thermodynamic properties of a system.**	9
4	❖ **Applications of statistics to gases:** **- The monatomic ideal gas, the distribution of molecular velocities, The principle of equipartition of energy, the quantized linear oscillator and specific heat capacity of a diatomic ideal gas.**	10
5	❖ **Applications of quantum statistics to other systems :** **The Einstein and Debye theories of the specific heat capacity of a solid, Black body radiation, Para magnetism and the electron gas.**	10
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Understand and apply the principles of statistical mechanics on ensembles of molecules. Understand and apply the principles of statistical mechanics on ensembles of molecules. Recognize the association between statistical mechanics and thermodynamics. Understanding of how intermolecular interaction affects the properties of matter.	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, Power point 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Exams: a) Quizzes (E-learning) b) Short exams (mid-term exams) c) Long exams (final) d) Oral exams Discussions during the lectures.
1.2	Use statistical mechanical computer programmers to calculate the properties of macroscopic systems.	1. Demonstrating the basic principle of the experiment. 2. Show the best ways to perform the experiments 3. Show the best ways to demonstrate the results. 4. Show the best way to write the reports about the experiment.	Home work. Writing scientific Reports. Doing team research or team project. Doing team work to perform some experiments Discussions during the class.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		5. Discussion with the student about the results.	
…			
2.0	**Skills**		
2.2	Solve problems in Physics by using suitable mathematical principles	1. Preparing main outlines for teaching 2.Following some proofs 3.Define duties for each chapter 4.Encourage the student to look for the information in different references 5.Ask the student to attend lectures for practice solving problem	Midterm theoretical exams (2) 30% Homework and Activities 10% quizzes 10% Final exam 50% Discussions of how to simplify or analyze some phenomena
2.3	Analyse and interpret quantitative results		
2.4	Express the physical phenomena mathematically.		
3.0	**Competence**		
3.1	Show responsibility for self-learning to be aware with recent developments in physics	• Search through the internet and use the library. • Small group discussion. • Enhance educational skills. • Develop their interest in Science through :(lab work, field trips, visits to scientific and research. • Encourage the student to attend lectures regularly Give students tasks of duties	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific values of reports. • Evaluate the work in team • Evaluation of the role of each student in lab group assignment • Evaluation of students presentations
3.2	Work effectively in groups and exercise leadership when appropriate.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Home works and quizes	All weeks	10 %
2	Midterm 1	7th week	20 %
3	Midterm 2	13th week	20%
4	Final Exam	16th week	50%
5			
6			
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

4 office hours per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1. **List Required Textbooks** 1. Thermodynamics, Kinetic theory, and statistical thermodynamics, 3rd edition, Francis W. Sears and Gerhard L. Salinger. 2. An introduction to thermodynamics and statistical mechanics second edition(2007). 3. Fundamentals of Statistical and Thermal Physics, by R. Reif, (2008). 4. 4. Concepts in thermal physics, Stephen J.Blundell and Katherine M.Blundell,2006. 5. M.D. Sturge, Statistical and Thermal Physics, Fundamentals and Applications (A.K. Peters, Natick, Massachusetts, 2003) ISBN 1-56881-196-9..
Essential References Materials	**(Journals, Reports**, etc.)
Electronic Materials	**Web Sites**
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room for 40 students, with data show. • Library
Technology Resources (AV, data show, Smart Board, software, etc.)	• (AV, data show, Smart Board, software, etc.) • data show + Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	(NA)

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Extent of achievement of course	students	questionnaires
learning outcomes	Program leader	Exam-questionnaires
Quality of learning resources	students	questionnaires
Evaluating the progress of student by projects	Instructor	exam

Evaluation Areas/Issues	Evaluators	Evaluation Methods

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics department
Reference No.	
Date	22/11/2019

Course Title:	**Classical Mechanics 2**
Course Code:	**4033144-2**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	**2**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 6/ 3rd year**
4. Pre-requisites for this course (if any)**:**	**Classical Mechanics 1 (4033143-4)**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	30	100%
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify) (Exams & Quizzes)	8
	Total	38
Other Learning Hours*		
1	**Study**	60
2	**Assignments**	20
3	**Library**	0
4	**Projects/Research Essays/Theses**	0
5	**Others** (specify) (Exams & Quizzes)	30
	Total	110

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course concern to by study the mechanics of rigid bodies in plane motion, in three dimensions, and their applications. Moreover, extensions of Newton's equations due to Lagrange and Hamilton, which allow for simplified treatments of many interesting problems

and which provide the foundation for the modern understanding of dynamics. This course provides students a sufficient background on the basics of classical mechanics enabling students to take more courses that are advanced in physics.

2. Course Main Objective

- Discuss the fundamental concepts in classical mechanics.
- Understand the physical basis of mechanics and dynamics of rigid body.
- Analyse the center of mass and moment of inertia of a rigid body.
- Describe the theorems of static equilibrium of rigid body.
- Use of matrices in rigid body dynamics.
- Build the link between physics theories and ideas with applications in the daily life.
- Discuss the Euler's equation of motion of a rigid body.
- Realize that the Lagrangian and the Hamiltonian formalism derived from the "least action principle" though they are alternative formulation of Newton's second law they are more general and allow to derive the relation between symmetries and conservation laws
- Use Lagrangian and the Hamiltonian formalisms to solve mechanical problems.
- Use the scientific method to understand the enormous variety of classical mechanics in terms of a few relatively simple laws as an overall goal.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	**Define** the physical quantities (center of mass of a rigid body, moment of inertia, angular momentum of a rigid body, products of inertia, rotational kinetic energy of a rigid body).	K1
1.2	**Describe** the laminar motion of a rigid body, body rolling down an inclined plane, motion of a rigid body under an impulsive force, Euler's equations of motion of a rigid body, generalized forces, and generalized momenta) using mathematics.	K2
2	**Skills:**	
2.1	**Apply** physical principles on day life phenomena.	S1
2.2	**Derive** the physical laws and formulas related to (the motion of a rigid body, Lagrange's equations).	S2
2.3	**Analyse** the quantitative results.	S3
3	**Competence:**	
3.1	**Work** effectively in groups.	C1
3.2	**Show** responsibility for self-learning to be aware with recent developments in physics.	C2
3.3	**Write** scientific reports.	C3

C. Course Content

No	List of Topics	Contact Hours
1	**Mechanics of Rigid Bodies, Planar Motion:** • Center of mass of a rigid body. • Some theorems of static equilibrium of rigid body. • Rotation of a rigid body about a fixed axis (Moment of Inerita). • Calculation of the moment of inertia. • The Physical Pendulum. • General theorem concerning angular momentum. • Laminar motion of rigid body. • Body rolling down in inclined plane. • Examples.	10

2	**Motion of Rigid Bodies in Three Dimensions:** • Angular momentum of a rigid body, Products of inertia. • Use of matrices in rigid body dynamics (the inertia tensor). • Determination of principle axes. • Rotational kinetic energy of a rigid body. • Moment of inertia of a rigid body about an arbitrary axis, the momental ellipsoid. • Euler's equation of motion of a rigid body. • Free rotation of a rigid body under no forces. Geometric description of the motion. • Free rotation of a rigid body with an axis of symmetry. Analytical treatment. • Examples.	10
3	**Lagrangian Mechanics:** • Generalized coordinates. • Generalized forces. • Lagrange's equations. • Some Applications of Lagrange's equations. • Generalized moments ignorable coordinate. • Lagrange's equations for impulsive forces. • Hamilton's variational principle. • The Hamiltonian function (Hamiltonian equation). • Lagrange's equations of motion with constraints. • Examples.	10
Total		30

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	**Define** the physical quantities (center of mass of a rigid body, moment of inertia, angular momentum of a rigid body, products of inertia, rotational kinetic energy of a rigid body).	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: Board, Power point. 4. Discussions. 5. Brain storming. 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Discussions during the lectures Exams: a) Quizzes. b) Short exams (mid-term exams) c) Long exams (final) d) Oral exams.
1.2	**Describe** the laminar motion of a rigid body, body rolling down an inclined plane, motion of a rigid body under an impulsive force, Euler's equations of motion of a rigid body, generalized forces, and generalized momenta) using mathematics.		
2.0	**Skills**		
2.1	**Apply** physical principles on day life phenomena.	1. Preparing main outlines. 2. Following some proofs. 3. Define duties for each chapter. 4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem.	1. Exams (Midterm, final, quizzes) 2. Asking about physical laws previously taught 4. Discussions of how to simplify or analyze some phenomena.
2.2	**Derive** the physical laws and formulas related to (the motion of a rigid body, Lagrange's equations).		
2.3	**Analyse** the quantitative results.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.0	**Competence**		
3.1	**Work** effectively in groups.	Inform the students about the followings: 1. How to search the internet and use the library. 2. How to cover missed lectures. 3. How to summarize lectures or to collect materials of the course. 4. How to solve difficulties in learning: solving problems – enhance educational skills. 5. Give students tasks of duties. 6. How to write reports. 7. How to work as a teamwork. 8. How to lead a Teamwork.	1. Evaluate the scientific reports. 2. Evaluate the team work in small groups. 3. Evaluate the efforts of each student in preparing the report.
3.2	**Show** responsibility for self-learning to be aware with recent developments in physics.		
3.3	**Write** scientific reports.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Periodic Exam 1	6th	20 %
2	Periodic Exam 2	12th	20 %
3	Homeworks & Quizzes	All weeks	10 %
4	Final Exam	End of the semester	50%
	Total		**100%**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics department and timetable for academic advice were given to the student each semester. (2hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• G. R. Fowles and G. L. Cassiday, "Analytical Mechanics", 7th ed. (2005) • G. R. Fowles, "Analytical Mechanics", 3rd ed. (1977).
Essential References Materials	• S. T. Thornton, and J. B. Marion, "classical Dynamics of Particles and Systems", 5th ed. (2003). • T. W. B. Kibble, and F. H. Berkshire, "Classical Mechanics", 5th ed. (2004).

Electronic Materials	https://academicearth.org/physics/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room for 30 students, Black (white) boards. • Library.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Class rooms provided with data show.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching Strategies	Students	Questionaire
Effectiveness of student assessment	Instructor	Exams
Extent of achievement of course learning outcomes	Instructor	Course report
Quality of learning resources	Instructor	Course report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics Department – College of Applied Science – Umm Al-Qura University
Reference No.	
Date	

Course Title:	**Electromagnetism (2)**
Course Code:	**4033342-3**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	**3**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	Undergraduate, 4st Year
4. Pre-requisites for this course (if any)**:**	Electromagnetism 1 (4033132-3)
5. Co-requisites for this course (if any)**:**	Theoretical Method in Physics 2 (4033141-4)

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Correspondence**	-	-
5	**Other**	-	-

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	0
3	**Tutorial**	٠
4	**Others** (specify) **Exams & Quizzes**	8
	Total	٥٣
Other Learning Hours*		
1	**Study**	٦٥
2	**Assignments**	15
3	**Library**	٠
4	**Projects/Research Essays/Theses**	٠
5	**Others** (specify) Exams & Quizzes	٢٠
	Total	١٦٣

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course extends to level 5 electromagnetism 1, and it covers the principle of electromagnetism: the magnetic field due to steady current, magnetic induction, magnetic energy, the magnetic materials, and their fields.

Also, it contains Maxwell's equations and their applications, Electromagnetic waves, propagation of the electromagnetic wave in different media.

This course will provide a conceptual background in electromagnetism sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

- ✓ Define the fundamentals of electromagnetic field and radiations.
- ✓ Define the magnetic field, magnetic flux, magnetic scalar potential, magnetic vector potential.
- ✓ Apply Biot-Savart law to calculate the magnetic field due to electric current.
- ✓ Apply Lorentz law to calculate the force acting on a wire carrying electric current placed in a magnetic field.
- ✓ Calculate the magnetic field using Ampere's law.
- ✓ Define the Faraday law of electromagnetic induction.
- ✓ Calculate the self-inductance and mutual inductance.
- ✓ Calculate the magnetic field due to a magnetized object.
- ✓ Define the magnetization, magnetic intensity, the magnetic permeability, magnetic susceptibility.
- ✓ Define the hysteresis loop.
- ✓ Define the diamagnetism, Paramagnetism, and ferromagnetism.
- ✓ Calculate the magnetic energy stored within the electric circuits.
- ✓ Calculate the density of magnetic energy.
- ✓ Understand Maxwell's equations in vacuum and the materials.
- ✓ Define the displacement current.
- ✓ Explain the electromagnetism in bulk materials (permittivity and permeability, D, and H fields) and investigating the concepts of field potential and energy was spent.
- ✓ Discuss Maxwell's equations and resulted in the triumphal prediction of electromagnetic radiation, but it is surprisingly hard to derive the specific equations for the radiation from an antenna.
- ✓ Describe, in words, how various concepts in electromagnetism come into play in particular situations; to represent these electromagnetic phenomena and fields mathematically in those situations, and to predict outcomes in other similar situations.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Demonstrate a mathematical description of electromagnetic phenomena based on necessary physical quantities through the fundamental equations of electromagnetism	K1

CLOs		Aligned PLOs
1.2	Describe the principles and dynamic phenomena of electromagnetism that occur in the case of time-varying sources (local charges and currents)	K2
1.3	Determine the magnetic fields, and Maxwell equations using analytical and numerical methods.	K3
2	**Skills :**	
2.1	Solve mathematical problems in all electromagnetic disciplines covered by the course	S1
2.2	Communicate with instructors and students, through the course webpage and by e-mail.	S2
2.3	Presents the electromagnetic concepts scientifically by electronic presentation with multimedia content in class	S3
3	**Competence:**	
3.1	Contribute in an interdisciplinary environment	C1
3.2	Be able to self-learning, analysis and synthesis of data and information using of the necessary technology	C2
3.3	Manage of new research ideas	C3

C. Course Content

No	List of Topics	Contact Hours
1	❖ **The Magnetic Field of Steady Current** a. Induction to magnetic field, b. Lorentz force law and its applications. c. Biot-Savart Law and its applications. d. Ampere's Law (differential and integral shape) e. Application of Ampere's law. f. Divergence and curl of magnetic field. g. The Magnetic Vector Potential, h. The Magnetic Scalar Potential i. The Magnetic Flux	١٢
2	❖ **The Electromagnetic Induction** a. Self Induction b. Mutual Induction c. The Neumann Formula	٤
3	❖ **Magnetic Properties of Matter** a. The origin of magnetism in the matter. b. Magnetic moment of the atom. c. Magnetization. d. Magnetic current density. e. Surface current density. f. Magnetic Intensity. g. Calculation of magnetic Field of a Magnetized Object. h. Magnetic susceptibility, i. Magnetic Permeability,	١٢

	j. Hysteresis loop. k. Classification of magnetic materials. l. Diamagnetic materials m. Paramagnetic materials. n. Ferromagnetic materials. o. Boundary condition of magnetic field. p. Electric circuits containing magnetic media. q. Magnetic circuits. r. Examples.	
4	❖ **Magnetic Energy** a. Magnetic energy of a solid circuit. b. Magnetic Energy of Coupled Circuits, c. Energy Density in Magnetic Field, d. Force and Torques on Rigid Circuits	٥
5	❖ **Maxwell's Equation's and Electromagnetic Waves** a. Displacement Current, b. Maxwell's Equation's c. Wave Equation for Electric and Magnetic Field d. Plane Wave e. Plane Waves in Isotropic Insulating Media f. Transfer of Plane Waves in Conductor g. Resistance of conductors at ultra-high frequencies. h. Applications of Maxwell's Equations ✓ Boundary Conditions. ✓ Refraction and Reflection at the boundary of two non-conducting media. i. Electromagnetic waves Energy j. The Wave Equation with Sources	١٢
Total		٤٥

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Demonstrate a mathematical description of electromagnetic phenomena based on necessary physical quantities through the fundamental equations of electromagnetism	1. The methodology of teaching that includes a curriculum design, planning and delivering teaching and assessment, combination of lectures and web-interactions by the lecturer. These will give the opportunity of students to understand the basic science of the	1. Periodical quizzes, assignments and homework 2. First and second mid- term exam and final exam 3. Emphasis of the students in the presence of the lecture continuously 4. Making the students are working small projects and report
1.2	Describe the principles and dynamic phenomena of electromagnetism that occur in the case of time-varying sources (local charges and currents)		
1.3	Determine the magnetic fields, and Maxwell equations using analytical and numerical methods.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		electromagnetic and its different applications in life. • Feedback and evaluation that include: quizzes, solve problems • Small group teaching and assessment learning. • Seminar presentation	for electromagnetically and its applications around us. 5. Ask the student to clear the miss understanding of the course
2.0	**Skills**		
2.1	Solve mathematical problems in all electromagnetic disciplines covered by the course	1. Preparing main outlines for teaching in the starting of the lecture 2. Define tasks for each chapter 3. Open discussions during the lectures 4. Brain storming, group work, homework assignments and small project 5. Encourage the student to look for the information in different sources	1. All exams and short quizzes must contain questions that can measure these skills. 2. Asking the students about physical meaning and laws previously taught 3. Emphasize the student writing reports on selected parts of the course 4. Discussions of how to simplify or analyses after the lecture
2.2	Communicate with instructors and students, through the course webpage and by e-mail.		
2.3	Presents the electromagnetic concepts scientifically by electronic presentation with multimedia content in class		
3.0	**Competence**		
3.1	Contribute in an interdisciplinary environment	1. Learn how to search the internet and use the library 2. Teamwork and small group discussion 3. Interactive learning 4. Case Study 5. Discuss with the student 6. Homework (preparing a report on some topics related to the course depending on web sites). 7. Seminars presentation	1. Making quizzes on the previous lecture. 2. Checking report and evaluate the efforts and scientific values of each student in preparing report. 3. Mini project and evaluate the work in team 4. Evaluation of the role of each student in teamwork assignment
3.2	Be able to self-learning, analysis and synthesis of data and information using of the necessary technology		
3.3	Manage of new research ideas		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		8. Field visits to laboratory and factories	5. Interaction with the lectures and discussions 6. Evaluation of presentations 7. Evaluation of reports 8. Oral discussion

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm 1	5th week	20%
2	Midterm 2	10th week	20%
3	Quizzes and In-Class Problem Solving	Each 2 weeks w	5%
6	Homework	Every week	5%
7	Final Exam	End of term	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics department and timetable for academic advice were given to the student each semester.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1. Foundations of Electromagnetic Theory by Reitz, John R., Milford, Frederick J., Christy, Robert W. [Addison-Wesley, 2008] 4th Edition 2. Electromagnetic Fields and Waves by Paul Lorrain, Dale R. Corson, Francois Lorrain [W. H. Freeman and Company, 1988] 3rd Edition 3. Introduction to Electrodynamics by David J. Griffiths, [Prentice-Hall, Inc., 1999], 3rd Edition.
Essential References Materials	1.Stump, Daniel R., and Gerald Pollack. Electromagnetism. Reading, MA: Addison-Wesley, 2002. ISBN: 9780805385670. 2.Jackson, J. D. Classical Electrodynamics. 3rd ed. New York, NY: John Wiley & Sons, 1998. ISBN: 9780471309321. 3.Landau, L. D., and E. M. Lifshitz. The Classical Theory of Fields. Burlington, MA: Elsevier Science Ltd., 1980. ISBN: 9780750627689.
Electronic Materials	1.Web Sites, Social Media, Blackboard, Facebook, Twitter, etc.) 2.Consult courses in website of the certified universities, 3.www.youtube.com.) 4.http://en.wikipedia.org/wiki/Electromagnetism

Other Learning Materials	Wikipedia

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	3- Lecture room for 30 students, Black (white) boards 4- Class room is already provided with data show
Technology Resources (AV, data show, Smart Board, software, etc.)	Providing classrooms with computers, data show, Smart Board, software, etc.)
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NA

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators (Faculty)	Evaluation Methods
Effectiveness of teaching	Students	Questionnaires
Effectiveness of assessment	Faculty	Exams, questionnaires, and course report
Extent of achievement of course learning outcomes	Instructor	Course report
Quality of learning resources	Instructor	Course report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics Department, Faculty of Applied Science, Umm Al-Qura University
Reference No.	
Date	

Course Title:	**Nuclear Physics**
Course Code:	**4034160-4**
Program:	**B.Sc Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm AL-Qura University**

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered:
4. Pre-requisites for this course (if any)**:** **QUANTUM MECHANICS (1)**
5. Co-requisites for this course (if any)**:** **Not applicable (N. A)**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom (including Laboratory classroom)**	**41+40=93**	**93.1%**
2	**Blended**	**6**	**6.9%**
3	**E-learning**	-	-
4	**Correspondence**	-	-
5	**Other**	-	-

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture (**Class Quizzes and Homework solving, Class Test Exams, oral discussion, student oral presentation)	**45**
2	**Laboratory/Studio**	**42**
3	**Tutorial**	**-**
4	**Others** (specify)	
	Total	**87**
Other Learning Hours*		
1	**Study**	**75**
2	**Assignments**	**15**
3	**Library**	**4**
4	**Projects/Research Essays/Theses**	**3**
5	**Others** (specify)	**-**
	Total	**97**

* The length of time that a learner takes to complete learning activities that lead to the achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will be cover the principle of nuclear physics, such as nuclear properties of the matter, Liquid drop and shell model, radiation. This also will be providng a conceptual and experimental background in the nuclear physics sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

The objectives of this course are to establish the meaning of the concepts of nuclear physics and elementary particles, and to ease out the theoretical models to describe the nuclear properties.

We want to be able:

The benchmark statement of the main learning outcomes are as follows:

1. To understand basic fundamentals of nuclear properties.
2. The students should be trained on physical and generic skills (knowledge – cognitive – interpersonal – communication – problem solving – IT)
3. To understand the liquid drop model.
4. To understand the nuclear drop model.
5. To understand the origin of alpha transition within the nucleus.
6. To understand the origin of Gamma transition within the nucleus.
7. To understand the origin of Beta transition within the nucleus.
8. To understand the elementary particles.

The overall goal is to understand the fundamentals of nuclear physics.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:** On successful completion of this course it is expected that students will be able to:	
1.1	Demonstrate the basic fundamentals of nuclear properties.	K1
1.2	Associate the quantum mechanics concepts to a proper understanding of nuclear physics phenomena proficiently.	K2
1.3		K3
1.4	Sketch the variation of binding energy per nucleon with nucleon number and define half-life and use the term to solve problems which might involve information in tables or decay curves.	K2,K3
1.5	Explain the relevance of binding energy per nucleon to nuclear fusion and to nuclear fission.	K3
2	**Skills:** On successful completion of this course it is expected that students will be able to:	

CLOs		Aligned PLOs
2.1	Determine nuclear properties such as binding energy, spin and parity in the framework of the liquid drop model and the shell model of the nucleus.	S1
2.2	State the key ideas of the Standard Models of nuclear physics, and name some current unsolved problems in nuclear physics.	
2.3	Explore physical phenomena by setting up experiments using a variety of laboratory instruments, collecting and analyzing data, and interpreting their results.	S2
2.4	Explain methods used to extract information about nuclei and particles through scattering experiments, and be able to derive quantitative information through calculations for simple cases.	S3
2.5	Acquire personal skills such as the ability to work both independently and in a group and argue with a scientific thinking behaviour.	S1
2.6	Be able to self-learning, analysis and synthesis of data and information using the necessary technology (e.g. ICT and software writing package).	S3
3	**Competence:** On successful completion of this course it is expected that students will be able to:	
3.1	Apply the scientific method to design, execute, and analyze a physical problem or an experiment.	C1
3.2	Prepare scientific research in a high quality form and introduce a report about certain scientific issue individually or participating with other students.	C2
3.3	Investigate the ability to identify the potential ethical issues in work-related situations; appreciation of intellectual property, environmental and sustainability issues; and promoting safe learning and working environment.	C3

C. Course Content
theortical partII:

No	List of Topics	Contact Hours
1	1- Nuclear Properties	6
	Definitions & Nuclear radii	
	Nuclear Mass-Binding Energy	
	Nuclear Radiation, Energy levels.	
	Nuclear Isomers.	
	Angular Momentum, Parity and Symmetry	
	Dipole moment, qudropole moment	

2	2- Liquid Drop Model	6
	Binding Energy	
	Sem-emperical Formula	
	Mass Spectrometer	
	Nuclear Reactions and Q-value	
		7
3	3- Nuclear Shell Model	
	Single Particle model with square well and Harmocia Oscillator	
	Magic Numbers	
	Spin for Different nuclei	
	Excited rootes nuclear magnetic moments	
	Parity	
	Isotopic spin	
		6
4	4- Gamma Transitions	
	Multiple Moments	
	Decay Constants	
	Selection Nucles	
	Angular Correlation	
	Internal Conversion	
		6
5	5- Alpha Transitions	
	Heavy Ions-Stabitlity	
	Decay Constants	
	Tunnel Effect	
	Energy Levels	
		6
6	6- Beta Transitions	
	Theorgy of B-decay	
	Allowed and Forbiddin transitions	
	Selection Nucles	
	Non Conservation of Parity	
		9
7	7- Elementary Particles	
	Nucler Force and Meson Theory	
	Pions & Mions	
	Kaons & Hyperons	
	Classi Fiction of demeray Pancles	
Total		45

EXpermintal partI:

No	List of Topics	Contact Hours
1	Theoretical Background and Review	6
2	Operating Plateau for the Geiger Tube	3
3	Half-Life Determination	3
4	Determining the half-life of Ba−137	3

5	Absorption Coefficient of Beta particles	3
6	Absorption Coefficient of Gamma Rays	3
7	Resolution time of Gm counter	3
8	Attenuation of Gamma rays by matter	3
9	Inverse Square Law	3
10	Counting Statistics	3
11	The Efficiency of a G-M Counter	3
12	Deflection of Beta Particles in a Magnetic Field	3
13	Gamma Ray spectroscopy Using a Scintillation Detector	3
Total		42

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Demonstrate the basic fundamentals of nuclear properties.	Demonstrating the basic information and principles through lectures. Lecturing method: Board,(b) Power point. Discussions Brain storming. Start each chapter by general idea and the benefit of it.	1.Quizzes, midterm, and final exams. Homeworks
1.2	Associate the quantum mechanics concepts to a proper understanding of nuclear physics phenomena proficiently.	Demonstrating the basic information and principles through lectures. Lecturing method: Board, Power point. Discussions Brain storming.	1. Quizzes, midterm, and final exams. .Homework.
1.3	Sketch the variation of binding energy per nucleon with nucleon number and define half-life and use the term to solve problems which might involve information in tables or decay curves.	Demonstrating the basic information and principles through lectures. Lecturing method: Board, Power point. Discussions Brain storming.	1. Quizzes, midterm, and final exams. .Homework.
1.4	Explain the relevance of binding energy per nucleon to nuclear fusion and to nuclear fission.	Demonstrating the basic information and principles through lectures.	1. Quizzes, midterm, and final exams. .Homework.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		Lecturing method: Board, Power point. Discussions Brain storming.	
2.0	**Skills**		
2.1	Determine nuclear properties such as binding energy, spin and parity in the framework of the liquid drop model and the shell model of the nucleus.	1. Following some proofs. 2. Define duties for each chapter. 3. Homework assignments. Encourage the student to look for the information in different references	1. Exams 2. Short quizzes. 3. Team work projects. Solving problems.
2.2	State the key ideas of the Standard Models of nuclear physics, and name some current unsolved problems in nuclear physics.	1. Group discussions. 2. Discussions Brain storming.	1. Exams 2. Short quizzes. 3. Asking about physical laws previously taught. 4. Team work projects. Solving problems
2.3	Explore physical phenomena by setting up experiments using a variety of laboratory instruments, collecting and analyzing data, and interpreting their results.	1. Demonstrating the basic information and principles through lectures. 2. Lecturing method: Board, Power point. 3. Discussions Brain storming.	1. Quizzes, midterm, and final exams. .Homework.
2.4	Explain methods used to extract information about nuclei and particles through scattering experiments, and be able to derive quantitative information through calculations for simple cases.	1. Group discussions. 2. Lecturing method: Board, Power point 3. Discussions Brain storming.	5. Exams 6. Short quizzes. 7. Asking about physical laws previously taught. 8. Team work projects. 9. Solving problems
2.5	Acquire personal skills such as the ability to work both independently and in a group and argue with a scientific thinking behaviour.	1. Group discussions. 2. Lecturing method: Board, Power point 3. Discussions Brain storming.	1. Discussion. 2. Homework. Reports.
2.6	Be able to self-learning, analysis and synthesis of data and information using the necessary technology (e.g. ICT and software writing package).	1. Group discussions. 2. Lecturing method: Board, Power point 3. Discussions Brain storming	3. Discussion. 4. Homework. Reports.
3.0	**Competence**		
3.1	Apply the scientific method to design, execute, and analyze a physical problem or an experiment.	1. Group discussion. 2. Cooperative learning. 3. Solving problems.	5. Discussion. 6. Homework. Reports.
3.2	Prepare scientific research in a high quality form and introduce a report about certain scientific issue individually or participating with other students.	1. Computational analysis. 2. Data representation. Focusing on some real results and its physical meaning.	1. Results of computations and analysis. 2. Homework.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.3	Investigate the ability to identify the potential ethical issues in work-related situations; appreciation of intellectual property, environmental and sustainability issues; and promoting safe learning and working environment.	1. Group discussion. 2. Cooperative learning. 3. Solving problems	1. Reports. 2. Projects .

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments, Quizzes and Homework	Weekly	10 %
2	Class Test Exam (Two Written Tests)	5 &13	20 %
3	Lab. reports	Weekly	10 %
4	Reports and essay (e.g. Oral Presentation, Research, and Group Project)	--	--
5	Final Practical Exam	10	10%
6	Final Exam (Written Test)	16	50 %

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

2 office hours per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	K. Heyde, Basic ideas and concepts in nuclear Physics, An introductory approach, second edition, Institute of physics publishing, Bristol and Philadelphia (1999) ISBN 0 7503-0534 7 hbk, 07503 0535 pbk. Irving Kaplan, Nuclear Physics, Second Edition, Addison-Wesley Publishing Company (1977). Kenneth S. Krane , Introductory nuclear Physics, , first edition, Jone Wily & Sons Inc. (1988) ISBN 0 - 471-80553-X . * Burcham, Nuclear and Particle Physics, 2 Edition, Longman Publisher (1995),ISBN-10 : 0582 450888 , -13: 978 - 0582 4508882
Essential References Materials	(Journals, Reports, etc.)
Electronic Materials	Web Sites

Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room for 40 students, with data show. • Library
Technology Resources (AV, data show, Smart Board, software, etc.)	• (AV, data show, Smart Board, software, etc.) • data show + Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	(NA)

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching	• Students • Classroom Observation • Professional Development Unit • External Reviewers such as the ASIIN Accreditation Agency	• Student Surveys • Formal Classroom Observation
Effectiveness of Assessment	• Curriculum and Test Development Unit • Curriculum Committee • Assessment Committee • External Reviewers such as the ASIIN Accreditation Agency	• Item Analysis Data • Teacher Feedback • Student Feedback • Course Reports
Extent of Achievement of Course Learning Outcomes	• Quality Assurance Unit • Curriculum and Test Development Unit	• Item Analysis Data • Course Reports • Annual Program Review

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics Department, Faculty of Applied Science, Umm Al-Qura University
Reference No.	
Date	

Course Title:	**Solid State Physics 1**
Course Code:	**4034170-4**
Program:	**BSc**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:
2. Course type **a.** University ☑ College ☐ Department ☐ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Level 7/4st Year
4. Pre-requisites for this course (if any)**:Quantum Mechanics 1 (code : 4033145-4)**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	Blended		
3	E-learning		
4	Correspondence		
5	Other		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	60
2	Laboratory/Studio	
3	Tutorial	
4	Exams & Quizzes	8
	Total	68
Other Learning Hours*		
1	Study	107
2	Assignments	15
3	Library	
4	Projects/Research Essays/Theses	
5	Exams & Quizzes	20
	Total	142

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover An introduction to the physics governing the different types of binding in solid state materials, Geometry of Solids and crystalline state of matter, Reciprocal Lattice, Brillouin zone, Modern theories describing lattice vibrations, Energy bands, X-Ray Diffraction, Electrons in solids, and Optical properties of solid materials. Free electron theory in metals, band theory, thermal properties of solid materials.

2. Course MainObjective

After completing this course student should be able to:

1. Define the principles and concepts of solid state physics.
2. Compare the origin of bonding in materials
3. Define the lattice planes & directions.
4. Explain the different types of defects in solid state and understand how it affect the physical properties of matter.
5. Explain how X-Rays Diffraction can be used in studying the solid structure.
6. Define phonons in crystals and distinguish between their different modes
7. Choose the right formulas to calculate specific heat & thermal conductivity of the lattice.
8. Recognize the main drawbacks of the free electron model in metals.
9. Identify: Bloch's theorem, Brillouin zones & Fermi surface in metals.
10. Classify different types of solid according to The Band Theory.
11. Distinguish between intrinsic & extrinsic Semiconductors and know their properties and applications.
12. Recognize the idea behind the Superconductivity phenomenon and be aware of its applications.

3.Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge:**	
1.1	Recognize the atomic theory and the Binding Forces	K1
1.2	Recognize the crystal structure and the properties	K1
1.3	Recognize the structural defects in crystals	K1
1.4	Investigate the X-Rays Diffraction in crystals	K3
1.5	Describe the lattice vibrations	K2
1.6	Describe the free electrons in metals	K2
1.7	Describe the band theory in the solids	K2
1.8	Describe the thermal properties of solid materials	K2
2	**Skills:**	
2.1	Differentiate between the different types of binding in solid materials.	S1
2.2	Describe the different types of crystal structure	S2
2.3	Analyse the electrical and thermal conductivity in Metals	S2
2.4	Interpret the band theory in solids and Explain methods of measurement and assessment of properties of solids.	S2
3	**Competence:**	
3.1	Communicate effectively in oral and written form.	C1
3.2	Collect and classify the material for the course.	C2
3.3	Use basic physics terminology in English	C1
3.4	Acquire the skills to use the internet communicates tools.	C2

C. Course Content

No	List of Topics	Contact Hours
1	❖ **The atomic Theory and Binding Forces** 17- Review of atomic structure	6

	18- Atomic binding and band theory 19- Binding forces between atoms 20- Lattice Energy Calculations 21- Types of bonds 22- Nucleation and growth kinetic 23- Experimental methods of crystal growth	
2	❖ **Crystal Structure** 38- Long range and short rang order 39- The crystalline state 40- Basic definitions of crystallography 41- The seven crystal systems 42- Wigner Seitz primitive cell 43- Symmetry elements of crystals 44- Important plane systems in a cubic crystals 45- Miller's indices for crystal planes	**6**
3	❖ **Crystal Properties** 16- Crystal Directions and distance between crystal plans 17- Zone , Zone Axis and angles between zones 18- Atomic structure of crystals 19- Cubic and hexagonal close-packed 20- Characteristic of FCC and BCC structure 21- The crystal structure of some simple crystals	**6**
4	❖ **Structural Defects in Crystals** 15- Point defects and Free energy of a crystal 16- Point defects in ionic crystals 17- Line defects and types of dislocation 18- Planer defects 19- Determination of vacancies concentration and the activation energy	**4**
5	❖ **X-Rays Diffraction in Crystals** 17- Used rays in studying crystal structure 18- Generation and properties of X-rays 19- X-Rays scattering from an atom 20- X-Rays scattering from a crystal and Reciprocal lattice	**6**
6	❖ **Lattice Vibrations** 11. Elastic waves 12. Modes of vibrations and density of states of a continuous medium 13. The phonon 14. Elastic and non-elastic scattering 15. Lattice waves of one-atomic linear chain 16. Vibration Modes of 1D diatomic	**4**
7	❖ **Free electrons in metals** 15. The Electrical Conductivity in Metals 16. The Specific Resistance in Metals 17. The Electrical and Thermal Conductivity in Metals 18. The Quantum Theory in Free Electrons 19. Ground State Property of Free Electrons 20. Electronic Specific Heat of Metals 21. Some Problems in Free Electron Model	**8**
88	❖ **Band theory in the solids** 1. Origin of the Bands in Solid 2. Periodic Potential	**8**

	3. Bloch Function 4. Crystal Structure in One-Dimensional Atomic Chain 5. Brillouin Zones 6. Band Theory in Free Electron Model 7. Density of States 8. The Effective Mass 9. Concept of Holes 10. Fermi Surfaces	
9	❖ **Thermal properties of solid materials** 1. Specific heat: 2. Einstein model for specific heat, 3. Debye model for specific heat, 4. Heat capacity of solid body, 5. Heat capacity of electron gas, 6. Thermal conductivity of solid body, 7. Thermal expansion	**12**
Total		**60**

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	Recognize the atomic theory and the Binding Forces	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, Power point 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	1. Solve some example during the lecture. 2. Homework. 3. Discussions during the lectures. 4.Exams: a) Quizzes b) Short exams (mid-term exams) c) Long exams (final) d) Oral exams
1.2	Recognize the crystal structure and the properties		
1.3	Recognize the structural defects in crystals		
1.4	Investigate the X-Rays Diffraction in crystals		
1.5	Describe the lattice vibrations		
1.6	Describe the free electrons in metals		
1.7	Describe the band theory in the solids		
1.8	Describe the thermal properties of solid materials		
2.0	**Skills**		
2.1	Differentiate between the different types of binding in solid materials.	1. Preparing main outlines for teaching 2.Following some proofs 3.Define duties for each chapter 4.Encourage the student to look for the information in different references 5.Ask the student to attend lectures for	1.Midterm's exam. Exams, short quizzes 2.Asking about physical laws previously taught 3.Writing reports on selected parts of the course 4.Discussions of how to simplify or analyze some phenomena
2.2	Describe the different types of crystal structure		
2.3	Analyse the electrical and thermal conductivity in Metals		
2.4	Interpret the band theory in solids and Explain methods of measurement and assessment of properties of solids.		

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
		practice solving problem	
3.0	**Competence**		
3.1	Communicate effectively in oral and written form.	3. Incorporating the use and utilization of computer, software, network and multimedia through courses 4. preparing a report on some topics related to the course depending on web sites	3. Evaluating the scientific reports. 4. Evaluating activities and homework
3.2	Collect and classify the material for the course.		
3.3	Use basic physics terminology in English.		
3.4	Acquire the skills to use the internet communicates tools.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	**All weeks**	**5 %**
2	Participation in activities lectures	**All weeks**	**5 %**
3	Written Test (1)	**6th week**	**20%**
4	Written Test (2)	**11th week**	**20%**
5	Final Exam (theoretical)	**16th week**	**50%**

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics department and the time table for academic advice were given to the student each semester. (4hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1- Charles Kittel, Introduction to Solid State Physics 7th Ed 2- Walter A. Harrison, Solid State Theory , Dover edition 1979
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classroom for 40 students with data show Library
Technology Resources (AV, data show, Smart Board, software, etc.)	Computer room Data show
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Each Classroom data show, and double layer white board.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
11. Following up the progress of students in the course.	instructor	Homework & quiz
12. Evaluating the progress of student	instructor	projects.
13. Evaluating the instructor.	student	questionnaires.
14. Revision of Exam paper	another staff member	Standers of the exam papers
15. Analysis the grades of students.	instructor	Gaussian distribution

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Computational Physics**
Course Code:	**4034180-3**
Program:	**BSc. Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	**3H**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 7/4th Year**
4. Pre-requisites for this course (if any)**:**	**Theoretical Methods in Physics (2) 4033142-4**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	65	90%
2	**Blended**	7	10%
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify) Exams & Quizzes	8
	Total	53
Other Learning Hours*		
1	**Study**	90
2	**Assignments**	15
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (specify) Exams & Quizzes	20
	Total	125

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course provides a direct preparation to solve scientific problems using calculus software High Level Languages. In particular, the student will use C/C++ Languages and the computational software, like MATLAB, in order to increase active learning in physics. This will enable student to perform:

- Well-structured C++ programs.
- Physical problems both numerically and analytically.
- Interactive simulations.

2. Course Main Objective

This course is designed to provide a variety of computational techniques for the Physical Sciences. A major goal of this course is to teach the student how to solve scientific problems using calculus software. In particular, the student will use the computational software, like MATLAB, in order to increase active learning in physics. This will enable student to perform

- Physical problems both numerically and analytically.
- Interactive simulations.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Demonstrate the fundamental principles and concepts of core knowledge of both c++ and matlab.	K1
1.2	Associate the mathematical concepts proficiently with both c++ and matlab	K2
1.3	Explore physical phenomena by matlab or c++.	K3
2	**Skills:**	
2.1	Apply c++ or matlab design, execute, and analyze a physical problem or an experiment.	S1
2.2	Explain some scientific theoretical manipulations by means of c++ and matlab.	S2
2.3	Communicate c++ and matlab concepts, processes, and both verbally and in writing.	S3
3	**Competence:**	
3.1	Participate effectively in multidisciplinary and/or interdisciplinary teams	C1
3.2	Be able to self-learn in physics-related topics with c++ or matlab..	C2
3.3	Manage a project (modelling or simulation) with due attention to time and resource management	C3

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Basics:** Variables and arrays, creating and initializing variables, Multidimensional array, sub-arrays, Special values, Displaying output data, Data files, scalar and array operations, Built in functions, Introduction to plotting, examples.	6
2	❖ **Program Design and Control Structures:**	6

	The logical data type, Branches, Additional plotting features, the while Loop, the FOR Loop, Logical arrays, Vectors, examples, Solving exercises.	
3	❖ **Using defined functions:** MATLAB functions, Variable passing, optional arguments, sharing data using Global memory, Preserving data between calls to a function, sub – Functions and private – functions, examples.	6
4	❖ **Complex data:** Complex variables, using complex numbers with relational operators, Complex functions, plotting complex data, examples and exercises.	6
5	❖ **Linear Algebra:** Solving a linear system, Gaussian elimination and exercises, Finding eigenvalues and eigenvectors, Matrix factorizations and examples.	3
6	❖ **Curve fitting and interpolation:** Polynomial fitting, Least square fitting, non-linear fits and examples, interpolation of data.	3
7	❖ **Numerical integration and differentiations:** Integration, differentiations, solving first order and second order Linear equation.	3
8	❖ **Introduction to programming language C++:** Flow Charts and Algorithms, Basic Elements of C++ language, Constructing, compiling and building simple program, Some programming techniques (looping, branching, etc…), Array Processing, Formatted I/O and File Processing, Some applications.	12
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Learning fundamentals of computational Physics.	• The methodology includes a combination of lectures by the lecturer, seminar presentation by the students and web-interactions. • Starting each Chapter by general idea and the benefit of the Mathematical and numerical tools. • Solving examples during the lecture time. • Show the best ways to deal with the problem. • Build a problem solving strategy.	Solve some example during the lecture. Exams: a) Quizzes (E-learning) b) Short exams (mid- term exams) c) Long exams (final) d) Oral exams e) Discussions during the lectures.
1.2	Understand how to translate a physical problem in mathematical form.		
1.3	Ability to solve Physical problems numerically in an efficient way.		
1.4	Improving the logical thinking.		
1.5	Understand how to Use mathematical software to describe the physical principle or phenomena.		
1.6	Developing the learning skills of the students in using computers as an educational tool, problem solving and demonstration.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		• All students will be involved in on-line learning process and each student is required to create an E-mail address to facilitate student web interactions. • Using computer simulations. • Enable reference books and scientific websites concerning computational techniques in Physics.	
2.0	**Skills**		
2.1	Develop analytic skills.	**1.** Develop ability to synthesize and integrate information. **2.** Encourage the students to use different learning resources. **3.** Writing the final answer in concise form when possible. **4.** Writing an equation/physical law in wards. **5.** Using shortest way to reach the final answer. **6.** Using appropriate symbols that can be easily memorized. **7.** Discussions of how to simplify or analyse physical problem.	1. Midterm's exam. Exams, short quizzes 2. Asking about physical laws previously taught 3. Writing reports on selected parts of the course 4. Discussions of how to simplify or analyze some phenomena
2.2	Develop problem-solving skills.		
2.3	Develop ability to think creatively		
2.4	Improve memory skills.		
2.5	Improve mathematical skills.		
2.6	Analyse and explain natural physical problem.		
3.0	**Competence**		
3.1	Develop ability to work independently.	**1.** Homework assignment for each group of the students. **2.** Homework assignments that should be worked out independently. **3.** Cooperative learning. **4.** Microteaching. **5.** Search through the internet and use the library. **6.** Develop their interest in Science through :(lab work, field trips, visits to scientific and research.	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific values of reports. • Evaluate the work in team • Evaluation of the role of each student in lab group assignment • Evaluation of students presentations
3.2	Develop ability to work productively with others.		
3.3	Improve self-esteem.		
3.4	Develop leadership skills.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10%
2	report	--	10%
3	Midterm Exam (1)	6th week	10%
4	Midterm Exam (2)	11th week	10%
5	Lab Exam	15th week	10 %
6	Final Exam	16th week	50 %
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester. (4hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1- Object oriented programming in C++, Robert Lafore, fourth edition, Pearson and Sam Publishing (2001), ISBN 0-672-32308-7. 2- Object oriented programming using C++, Joyce Farrel, fourth edition, 2009, ISBN-13: 978-1-4239-0257-7. 3- Getting started with MATLAB, Rudra Pratap, New York, 2010, ISBN: 978-0-19-973124-4 4- MATLAB, "An introduction with Applications", fourth edition, Amos Gilat, John Wiley and Sons, INC, 2011, ISBN-13 978-0-470-76785-6. 5- Essentials of MATLAB programming, Second Edition, Stephen J. Chapman, 2009, ISBN-13: 978-0-495-29568-6.
Essential References Materials	Solving Applied Mathematical problems with MATLAB, DINGYU XUE and YANGQUAN CHEN, CRC Press, 2009 by Taylor and Francis Group, ISBN-13: 978-1-4200-8250-0
Electronic Materials	1. www.mpipks-dresden.mpg.de/~jochen/methoden/outline.html 2. People.uncw.edu/hermanr/phy311/mathphysbook/index.html
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Class room is already provided with data show. • The area of class room is suitable concerning the number of enrolled students (68) and air conditioned. • Library. Laboratory for fundamental of physics.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Computer room. • MATLAB software.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Analysis the grades of students. Use modern method of learning (e.g. data show, PPT, movies, e-learning,...) Link the course to the life application. The instructors of the course are checking together and put a unique process of evaluation.	• The instructors of the course • Check marking of a sample of papers by others in the department. • Feedback evaluation of teaching from independent organization. • Independent evaluation by another instructor that give the same course in another faculty. • Evaluation by the accreditation committee in the university.	○ Student evaluation ○ Course report ○ Program report ○ Program Self study

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Radiation Physics**
Course Code:	**4034162-3**
Program:	**Pure physics**
Department:	**Physics**
College:	**Faculty of Applied Science**
Institution:	**Umm AL-Qurra University**

A. Course Identification

1. Credit hours:	**3 Hrs**
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☐ Elective ☐
3. Level/year at which this course is offered:	**Level 8 / 4th Year**
4. Pre-requisites for this course (if any)**:**	**Nuclear Physics(4034160-4)**
5. Co-requisites for this course (if any)**:**	**no**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	%١٠٠
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	٨
	Total	٥٣
Other Learning Hours*		
1	**Study**	٩٠
2	**Assignments**	١٥
3	**Library**	
4	**Projects/Research Essays/Theses**	
5	**Others** (specify)	٢٠
	Total	١٢٥

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of physics, such as measurements, work and energy, newtons's laws, heat , fluid mechanics, and light. This course will provide a conceptual and experimental back ground in physics sufficient to enable to take courses that are more advanced in related fields.

The course will cover the principle of radiation physics, such as interaction with matter, dosimetery, detectors, biological effects, measurments and protection sources of radiation. Units procedure and methods of radiation dosimetry. This course will provide a conceptual and experimental background in radiation physics sufficient to enable students to take courses that are more advanced in related fields

2. Course Main Objective

1. Acquire basics of information about interaction of radiation with matter
2. Acquire the basic of radiation diosmetry.
3. Describe types of radiation Detectors.
4. Acquire information about biological effects of radiation dosimetry.
5. Acqire the basic of external radiation protection.
6. List the natural and artificial sources of radiation.
7. Aquire procedure of radiation dosimetry.
8. Describe the mthods for radiation dosimetry.

. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

1- Outlines of the physical laws, principles and the associated proofs.
2. Highlighting the day life applications whenever exist.
3. Encourage the students to see more details in the international web sites and reference books in the library.
4- Encourage the student to build an example of different experiments related to course
5- Frequently check for the latest discovery in science

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Recognize facts, principle and concepts of elementary Physics	K1
1.2	Describe concepts, Procedures of some experiments in physics	K3
2	**Skills:**	
2.1	Apply the laws of physics.	S1
2.2	Solve problems in Physics by using suitable mathematical principles	S1
2.3	Analyse and interpret quantitative results	S1
2.٤	Express the physical phenomena mathematically.	S1
3	**Competence:**	
3.1	Show responsibility for self-learning to be aware with recent developments in physics	C2
3.2	Work effectively in groups and exercise leadership when appropriate.	C1

C. Course Content

No	List of Topics	Contact Hours
1	**Interaction of Radiation with matter** 1. The energy transfer 2. Range of heavy charged particles (alpha particle), 3. The specific ionization and the stopping power.	٣
٢	**Interaction of Radiation with matter** 1. The energy transfer from electron to the matter. 2. Energy loss by inelastic collision and by radiation. 3. Absorption of electrons, the half-thickness. 4. Range determination from the absorption curve.	٦
3.	**Interaction of Radiation with matter** 1. The energy transfer from gamma radiation to matter 2. The energy loss by inelastic collsion 3. The neutron elastic and inelastic scattering, 4. The neutron capture. Transmutation, 5. The total neutron cross section and its determination.	3
4.	**Units of Radiation Dosimetry** 20-Radiation flux density 21-The exposure. 22-Roentgen. 23-The radiation absorbed dose. 24-Relative biological effectiveness.	3
5.	**Units of Radiation Dosimetry** 21-The radiation-weighting factor. 22-The tissue equivalent dose. 23-The tissue-weighting factor. 24-The effective dose. 25-The collective effective dose, the dose rate.	6
6.	**Biological Effects of radiation** 1- Interaction of the ionizing radiation with the cell (the physical stage, the - physico-chemical stage, the chemical stage and the biological stage). 2- The deterministic and stochastic effects. 3- The late effects. 4- The risk factor. The hereditary effects of radiation.	3
7.	**Radiation Detectors** - motion of electrons and ions in gases (the drift motion, the attachment and the recombination) 22. -The electron and ion currents in gases 23. The gas detectors :the ionization chamber, 24. The proportional counters, Geiger-Muller counters. 25. The scintillation detectors. 26. -The semiconductor detectors. Cerencov detectors.	6

8.	**Dosimeters** 6. Pocket Dosimeters. 7. Film Badges. 8. Thermo-luminescent Dosimeter. 9. Ion Current Chamber	٣
9.	**External Radiation Protection** 16. The natural and non-made sources of radiation and their sources (cosmic rays, the terrestrial radiation, the radon gas), 17. The artificial sources of radiation (the diagnostic radiology, therapeutic radiology, the nuclear energy and industries, the radioactive waste, the radioactive dust), 18. Techniques of protection (time, distance, shields).	6
10.	**Fundamental Sciences** 16. -Quantities and units in science and engineering Background information 17. -Excitation and Ionization	3
11.	**Reflection and refraction of light at plane surface** 6. Spherical mirrors 7. Spherical refracting surfaces. 8. Thin lenses 9. Compound optical systems 10. Optical instruments	3
12.	**Exercises and Solved problems**	3
Total		45

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Recognize facts, principle and concepts of elementary Physics	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, Power point 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Exams: a) Quizzes (E-learning) b) Short exams (mid- term exams) c) Long exams (final) d) Oral exams Discussions during the lectures.
1.2	Describe concepts, Procedures of some experiments in physics	1. Demonstrating the basic principle of the experiment. 2. Show the best ways to perform the experiments 3. Show the best ways to demonstrate the results. 4. Show the best way to write the reports about the experiment. 5. Discussion with the student about the results.	Home work. Writing scientific Reports. Doing team research or team project. Doing team work to perform some experiments Discussions during the class.
2.0	**Skills**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Apply the laws of physics.	1. Preparing main outlines for teaching 2.Following some proofs 3.Define duties for each chapter 4.Encourage the student to look for the information in different references 5.Ask the student to attend lectures for practice solving problem	1.Midterm's exam. Exams, short quizzes 2.Asking about physical laws previously taught 3.Writing reports on selected parts of the course 4.Discussions of how to simplify or analyze some phenomena
2.2	Solve problems in Physics by using suitable mathematical principles		
2.3	Analyse and interpret quantitative results		
2.4	Express the physical phenomena mathematically.		
3.0	**Competence**		
3.1	Show responsibility for self-learning to be aware with recent developments in physics	• Search through the internet and use the library. • Lab work. • Small group discussion. • Enhance educational skills. • Develop their interest in Science through :(lab work, field trips, visits to scientific and research. • Encourage the student to attend lectures regularly Give students tasks of duties	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific values of reports. • Evaluate the work in team • Evaluation of the role of each student in lab group assignment Evaluation of students presentations
3.2	Work effectively in groups and exercise leadership when appropriate.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	First exam	10-11th weeks	%20
2	Second exam	13 – 14th weeks	%20
3	Quizzes	All weeks	%2.5
4	Research	During Semester	%2.5
5	Final exam	16th week	%٥٠
6	HW	All weeks	%5

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester. (4hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	✓ "A Primer In Applied Radiation Physics", F.A.SMITH, Ed. World Scientific, 2000. ✓ "Radiation Physics for Medical Physicist", E. B. Podgorsak, Ed. Springer. 2006

	✓ . Radiation physics for medical physicists Ervin B. Podgorsak Springer 2006. Electronic Materials, Web Sites (eg. Web Sites, Social Media, Blackboard, etc.) ✓ http://www.IAEA.com, http://ICRP.com, http://NCRP..com., http://ICRU.com, ✓ http://UNSCAR.com, http://ANSI.com, http://WHO.com
Essential References Materials	
Electronic Materials	www.uqu.sa/eemohamad
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	There are enough classrooms provided with a good accommodation, including good air condition, good Data .show, suitable white board There are enough laboratories for experimental physics, provided with air conditions, good data show, and .experimental equipment
Technology Resources (AV, data show, Smart Board, software, etc.)	In each class room and laboratories, there is a data show, and board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Each Class room and laboratories require a TV screen at .least 65 inch-and smart, and double layer white board

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

Course Title:	**Solid State physics II**
Course Code:	**4034172-4**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	
2. Course type	
a. University [X] College [X] Department [X] Others [ ]	
b. Required [X] Elective [ ]	
3. Level/year at which this course is offered:	
4. Pre-requisites for this course (if any)**:** Solid state physics 1	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	56	80
2	**Blended**		
3	**E-learning**		
4	**Correspondence**		
5	**Other**		

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	45
3	**Tutorial**	6
4	**Others** (office hours)	30
	Total	126
Other Learning Hours*		
1	**Study**	62
2	**Assignments**	15
3	**Library**	5
4	**Projects/Research Essays/Theses**	
5	**Others** (quizzes)	20
	Total	102

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover An introduction to the physics governing the different types of materials , dielectric materials, magnetic material, and superconductors and semiconductors

2. Course Main Objective

1. What is the main purpose for this course?

After completing this course student should be able to:

- ✓ Define the dielectrics, ferroelectrics, polarization and their properties, and discuss the theories describe the phenomenon and its applications.
- ✓ Define the diamagnetics , paramagnetics, ferromagnetic materials and their properties and its applications.
- ✓ Define the supperconductors and their properties, and discuss the theories describe the phenomenon and its applications.
- ✓ Define the semiconductors, and discuss their properties and its applications.

2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)

- ✓ Explain the strategy of the course in the beginning of the semester
- ✓ Outlines of the physical laws, principles and the associated proofs.
- ✓ Encourage the students to see more details in the international web sites and reference books in the library.
- ✓ Discussing some selected problems in each chapter.
- ✓ Renew the course references frequently
- ✓ Frequently check for the latest discovery in science

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Define the physical quantities, physical phenomena, and basic principles concerning solid-state physics.	K1
1.2	Describe the physical laws and quantities using mathematics concerning solid state physics	K1
1.3	Determine the physical quantities at the solid state Lab.	K3
2.0	**Skills**	
2.1	Apply the laws of physics to calculate some quantities concerning solid state physics.	S1
2.2	Solve problems solid state course by using suitable mathematics.	S2
2.3	Analyse and interpret quantitative results.	S1
2.4	Apply physical principles of solid state materials on day life phenomena.	S3
2.5	Derive the physical laws and formulas related to the solid state physics.	S2
3	**Competence:**	
3.1	Show responsibility for self-learning to be aware with recent developments in physics.	C1
3.2	Write scinetif reports.	C2
3.3	Work effectively in groups.	C3

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Dielectrics** 24- Review of the characteristics of Dieletric materials 25- Polarization phenomena 26- Types of polarization 27- Ferroelctricity The microscopic model of ferroelectric domain.	12
2	❖ **Magnetism and magnetic materials** 1- Review of the characteristics of magnetic materials and Basic Formulas control the phenomena and calculating the Magnetic susceptibility. 2- The Atomic Origin of Magnetism 3- Diamagnetism and Langevin theory. 4- Paramagnetism : Classical and Quantum Theory of Paramagnetism. 5- Ferro-Magnetism: Properties, Curie law and Curie Wise law, 6- Rare Earth and Iron Group Ions and Magnetism in Metals. 7- Ferro-Magnetism in Insulators, the Molecular Field Theory, Anti and Ferri-Magnetism and Ferro-Magnetization Process.	20
3	❖ **Superconductivity:** Zero Resistance, Occurrence of Super Conductivity and the Meissner Effect. The Critical Field, Thermodynamics of the Super Conductivity Transition and the Two-Fluid Model. Superconductivity theory and Copper pair electron. Josephson Junction and SOQUED	12
4	❖ **Semiconductors** 1- Theory of Electrical Conduction: Drift of electrons in an electric field, Mobility, Drift current, Diffusion current, Transport equations, Quasi-Fermi levels 2- Generation/Recombination Phenomena: Direct and indirect transitions, Generation/recombination centers, Excess carrier lifetime, SRH recombination, Surface recombination 3- The PN Junction Diode: Unbiased and biased PN junction, Current-voltage characteristics, PN junction capacitance. Models for the PN junction, Solar cell, PiN diode 4- Metal-semiconductor contacts: Schottky diode, Ohmic contact Junction Field Effect, JFET and Bipolar Junction Transistors, BJT	16
Total		**56 hrs**

Practical Part

1- Determination of the activation energy of the semiconductors
2- Determination of the dielectric constant with the frequency for a dielectric
3- Determination of magnetic permeability of the magnetic materials
4- Determination of the M-B hysterics curve.
5- Determination of the Hall effect
6- Determination of the crystal structure of some crystal using x-ray diffractometer.

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Define the physical quantities, physical phenomena, and basic principles concerning solid-state physics.	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: Board, Power point. 4. Discussions 5. Brain storming 6. Start each chapter by general idea and the benefit of it.	Solve some example during the lecture. Discussions during the lectures Exams: a) Quizzes (E-learning) b) Short exams (mid- term exams) c) Long exams (final) d) Oral exams .
1.2	Describe the physical laws and quantities using mathematics concerning solid state physics		
1.3	Determine the physical quantities at the solid state Lab.	1. Doing team research or team project. 2.Doing team work to perform some experiments 3. Perform the experiments correctly. 4. Demonstrate the results correctly. 5. Write the reports about the experiment. 6. Discussion with the student about the results	Writing scientific Reports. Lab assignments Exam.
2.0	**Skills**		
2.1	Apply the laws of physics to calculate some quantities concerning solid state physics.	1. Preparing main outlines for teaching. 2. Following some proofs. 3. Define duties for each chapter 4. Encourage the student to look for the information in different references. 5. Ask the student to attend lectures for practice solving problem.	1. Exams (Midterm, final, quizzes) 2. Asking about physical laws previously taught 3. Writing reports on selected parts of the course. 4. Discussions of how to simplify or analyze some phenomena.
2.2	Solve problems solid state course by using suitable mathematics.		
2.3	Analyse and interpret quantitative results.		
2.4	Apply physical principles of solid state materials on day life phenomena.		
2.5	Derive the physical laws and formulas related to the solid state physics.		
3.0	**Competence**		
3.1	**Show** responsibility for self-learning to be aware with recent developments in physics.	Inform the students about the followings: 1. How to search the internet and use the library. 2. How to cover missed lectures. 3. How to summarize lectures or to collect materials of the course. 4. How to solve difficulties in learning:	1.Checking report on internet. 2.Discussion. 3.calculate the accuracy of the measure quantity. 4.Presenting the results.
3.2	**Write** scinetif reports.		
3.3	**Work** effectively in groups.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		solving problems – enhance educational skills. 5. Give students tasks of duties. 6. How to write reports. 7. How to work as a teamwork. 8. How to lead a Teamwork. 9. How to discuss with others .	

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	1st Midterm Exam (theoretical)	7th week	10 %
2	2nd Midterm Exam (theoretical)	13th week	10 %
3	Lab. Reports (Practical)	8th week	10 %
4	Quizzes and tutorials	10 th week	10 %
5	Final Exam (Practical)	15th week	10%
6	Final Exam (theoretical)	16th week	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

   - **Office hours 2 hr/ week**

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1- "An Introduction to Solid States Physics", C. Kittle, 8th Edition, John Wiley & Son Inc (2005). 2- 2- "Solid State Physics, Ashcroft & Mermin", 1st Edition, Harcourt Asia Pte Ltd (1976). 3- 3- "Introduction to condensed matter Physics." Feng Duan & Jin Guojun, (World Scientific, 2005). 4- The Oxford solid state basics, Steven H. and Simon, Oxford university press 2016
Essential References Materials	
Electronic Materials	Websites on the internet that are relevant to the course topics

Other Learning Materials	Multimedia associated with the text book and the relevant websites

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture room with at least 25 seats / labs with at least 15 benchs .
Technology Resources (AV, data show, Smart Board, software, etc.)	• Computer room containing at least 15 systems.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	•Availability of demonstrative materials relevant to the course material • Safety facilities

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
• Course evaluation by student	Instructor	Direct oral communicatiom
• Students- faculty meetings	Group of students	communicatiom
• Peer consultation on teaching • Departmental council discussions • Discussions within the group of faculty teaching the course	Instructor	Oral test and quizzes
• Providing samples of all kinds of assessments in the departmental course portfolio of each course • Assigning group of faculty members teaching the same course to grade the same questions for various students.	Instructor	Exams
The course material and learning outcomes are periodically reviewed and the changes to be taken are approved in the departmental and higher councils. • The head of department and faculty take the responsibility of implementing the proposed changes in the course materials.	Instructor + The head of department	Course report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics Depratment, Faculty of Applied Science, Umm AlQura University
Reference No.	
Date	

Course Title:	**Electronics**
Course Code:	**4034173-4**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours: 3
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐
3. Level/year at which this course is offered: Undergraduate, 4st Year
4. Pre-requisites for this course (if any)**:** solid state 1 **– 4034179-4**
5. Co-requisites for this course (if any)**:**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	45	100%
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Correspondence**	-	-
5	**Other**	-	-

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	45
2	**Laboratory/Studio**	42
3	**Others** (specify) **Exams & Quizzes**	6
	Total	93
Other Learning Hours*		
1	**Study**	62
2	**Assignments**	15
3	**Laboratory/Studio**	20
4	**Projects/Research Essays/Theses**	.
5	**Others** (specify) Exams & Quizzes	20

	Total	117
	Total	٢١٠

* The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course extends to level 4, and it covers the principle of the physics of electronics semiconducting devices: such as pn junction diode, different types of diodes, bipolar junction transistor, BJT amplifiers, Felid effect transistors, operational amplifier, digital electronics (logic gats).

This course aims to explain and discuss the physics of each electronic device stricter and the theory of operation and its application.

This course will provide a sufficient conceptual background in electronics to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

- ✓ Define the fundamentals of semiconducting materials used in electronic devices.
- ✓ Discussing the basics of pn junction and characterizes of diodes and their different applications in different electronic circuits, and understanding the basics of special-purpose diodes.
- ✓ Discussing the basics bipolarjunction transistors (BjTs)
- ✓ Analyses transistor bias circuits, and the operation concept of BjT amplifiers
- ✓ Understanding the construction and characteristics of field-effect transistors (FETs.
- ✓ Analyses of FET amplifiers circuits.
- ✓ Explaining the applications of power amplifiers.
- ✓ Studying the amplifier frequency response.
- ✓ Exploring the concepts of thyristors and other devices.
- ✓ Understanding the construction and characteristics of the operational amplifier and basic Op-Amp circuits.
- ✓ Studying the basics and characteristics of active filters
- ✓ Logic circuits and programmable analog arrays.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Demonstrate a physical description of the operation concepts of different electronic devices, such as diodes and transistors.	K1
1.2	Describe the function of some electronic devices.	K2
1.3	Determine the physical parameters of electronic circuits containing diodes, BJT and FET transistors.	K3
2	**Skills :**	
2.1	Solve and analyses the electronic circuits containing electronics devices, such as diodes, bipolar junction and field effect transistors.	S1
2.2	Communicate with instructors and students, through the course webpage and by e-mail.	S2
2.3	Presents and explain the working principals of electronic devices.	S3
3	**Competence:**	
3.1	Contribute in an interdisciplinary environment	C1
3.2	Be able to self-learning, analysis and synthesis of data and information using of the necessary technology	C2
3.3	Manage of new research ideas	C3

C. Course Content

No	List of Topics/ 4	Contact Hours
1	❖ **Semiconductor Basics** j. Atomic Structure 4 k. Semiconductors, Conductors, and Insulators l. Covalent Bonds m. Conduction in Semiconductors n. N-Type and P-Type Semiconductors o. The Diode p. Biasing a Diode q. Voltage-Current Characteristic of a Diode	٤

	r. Diode Models	
2	❖ **Diode Applications** d. Half- Wave Rectifiers e. Full-Wave Rectifiers f. Power Supply Filters and Regulators g. Diode Limiting and Clamping Circuits	٤
3	❖ **Special-Purpose Diodes** s. Zener Diodes t. Zener Diode Applications u. Varactor Diodes v. Optical Diodes	٣
4	❖ **Bipolarjunction Transistors (BjTs)** e. Transistor Structure f. 4-2 Basic Transistor Operation g. Transistor Characteristics and parameters h. The Transistor as an Amplifier i. The Transistor as a Switch	٤
5	❖ **Transistor Bias Circuits 216** k. The DC Operating Point, l. Voltage-Divider Bias m. Other Bias Methods	٤
	❖ **BjT Amplifiers** a. Amplifier Operation b. Transistor AC Equivalent Circuits c. The Common-Emitter Amplifier d. The Common-Collector Amplifier e. The Common-Base Amplifier f. Multistage Amplifiers g. The Differential Amplifier	٤
	❖ **Field-Effect Transistors (FETs)** a. The JFET b. JFET Characteristics and Parameters c. JFET Biasing d. MOSFET Characteristics and parameters	٤

	e. FET Amplifiers	
	❖ **Power Amplifiers** a. Class A Power Amplifiers b. Class B and Class AB Push-Pull Amplifiers c. Class C Amplifiers	٤
	❖ **Amplifier Frequency Response** a. Basic Concepts b. The Decibel c. Low-Frequency Amplifier Response d. High-Frequency Amplifier Response e. Total Amplifier Frequency Response f. Frequency Response of Multistage Amplifiers	٤
	❖ **Thyristors and Other Devices** a. The Basic 4-Layer Device a. The Silicon-Controlled Rectifier (SCR) b. SCR Applications c. The Diac and Triac	٢
	❖ **The Operational Amplifier** a. Introduction to Operational Amplifiers b. Op-Amp Input Modes and c. Parameters d. Negative Feedback	٤
	❖ **Programmable Analog Arrays** a. Logic circuits b. The Field-Programmable Analog Array (FPAA) c. Switched-Capacitor Circuits	٤
Total		٤٥

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.1	Demonstrate a the principal of operation of the studied electronic devices	2.The methodology of teaching that includes a curriculum design, planning and delivering teaching and assessment, combination of lectures and web-interactions by the lecturer. These will give the opportunity of students to understand the basic science of the principal of operation of the studied electronic devices and its different applications in life. • Feedback and evaluation that include: quizzes, solve problems • Small group teaching and assessment learning. • Seminar presentation	6.Periodical quizzes, assignments and homework 7.First and second mid- term exam and final exam 8.Emphasis of the students in the presence of the lecture continuously 9.Making the students are working small projects and report for an electronic device and its applications around us. 10. Ask the student to clear the miss understanding of the course
1.2	Describe how the structure of electronic device control and specify its funcution.		
1.3	Determine the circuit parameters of certain device by analyses the diagram.		
2.0	**Skills**		
2.1	Solve the electronic circuits covered by the course to determine the device	6.Preparing main outlines for	5.All exams and short quizzes must

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	parameters and extract its characteristics.	teaching in the starting of the lecture 7. Define tasks for each chapter 8. Open discussions during the lectures 9. Brain storming, group work, homework assignments and small project 10. Encourage the student to look for the information in different sources	contain questions that can measure these skills. 6. Asking the students about physical meaning and laws previously taught 7. Emphasize the student writing reports on selected parts of the course 8. Discussions of how to simplify or analyses after the lecture
2.2	Communicate with instructors and students, through the course webpage and by e-mail.		
2.3	Presents the electronic device concepts scientifically by electronic presentation with multimedia content in class		
3.0	**Competence**		
3.1	Contribute in an interdisciplinary environment	9. Learn how to search the internet and use the library 10. Teamwork and small group discussion 11. Interactive learning 12. Case Study 13. Discuss with the student 14. Homework (preparing a report on some topics related to the course	9. Making quizzes on the previous lecture. 10. Checking report and evaluate the efforts and scientific values of each student in preparing report. 11. Mini project and evaluate the work in team 12. Evaluation of the role of each
3.2	Be able to self-learning, analysis and synthesis of data and information using of the necessary technology		
3.3	Manage of new research ideas		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		depending on web sites). 15. Seminars presentation 16. Field visits to laboratory and factories	student in teamwork assignment 13. Interaction with the lectures and discussions 14. Evaluation of presentations 15. Evaluation of reports 16. Oral discussion

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm 1	5th week	10%
2	Midterm 2	10th week	10%
3	Quizzes and In-Class Problem Solving	Each 2 weeks w	5%
4	Presence of students	All lectures	10%
5	Experimental	12th week	10%
6	Exp. Report	Every week	5%
7	Final Exam	End of term	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics department and timetable for academic advice were given to the student each semester.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	4. Thomas l. Floyd, ELECTRONIC DEVICES, Pearson Education International Inc., Pearson Prentice Hall, 2005. ٥. الأجهزة الإلكترونية (الطبعة الرابعة): تأليف توماس فلويد، ترجمة أ.د./ يسري مصطفى و ا.د./ جمال الصغير الفردغ، مركز النشر العلمي لجامعة السابع من أبريل، الزاوية، ليبيا، ٢٠٠٨.
Essential References Materials	
Electronic Materials	5.Web Sites, Social Media, Blackboard, Facebook, Twitter, etc.) 6.Consult courses in website of the certified universities, 7.www.youtube.com.) 8.http://en.wikipedia.org/wiki/electronic devices
Other Learning Materials	Wikipedia

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	5- Lecture room for 30 students, Black (white) boards 6- Class room is already provided with data show
Technology Resources (AV, data show, Smart Board, software, etc.)	Providing classrooms with computers, data show, Smart Board, software, etc.)
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	NA

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators (Faculty)	Evaluation Methods
Effectiveness of teaching	Students	Questionnaires
Effectiveness of assessment	Faculty	Exams, questionnaires, and course report
Extent of achievement of course learning outcomes	Instructor	Course report
Quality of learning resources	Instructor	Course report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Physics Department, Faculty of Applied Science, Umm Al-Qura University
Reference No.	
Date	

Course Title:	**Graduation Project**
Course Code:	**40341990-3**
Program:	**BSc**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

A. Course Identification

1. Credit hours:	
2. Course type	
a.	University ☑ College ☑ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	**Level 8 / 4th Year**
4. Pre-requisites for this course (if any)**:**	**Agreement of the Department council**
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		
2	Blended		
3	E-learning		
4	Correspondence		
5	Other	30	100%

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	Lecture	
2	Laboratory/Studio	30
3	Tutorial	
4	Exams & Quizzes	
	Total	30
Other Learning Hours*		
1	Study	
2	Assignments	
3	Library	
4	Projects/Research Essays/Theses	30
5	Exams & Quizzes	
	Total	30

*The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

Physics is concerned with the observation, understanding and prediction of natural phenomena and the behavior of manmade systems. It deals with profound questions about the nature of the universe and with some of the most important practical, environmental technology issues. Its scope is broad and involves mathematical theories, experiments and observation, computing technology, materials, nuclear energy and magnetism.
The program will require a project program that enables the students to experience the real work environment in laboratories. It also provides an opportunity to participate in group work. The student will spend a time working in a physics Lab. Upon completion of Project, a student will be required to write a brief report on his work experience and present it orally

2. Course Main Objective

1. Gain first-hand experience of work place environment in the field of scientific research.
2. Gain practical and theoretical knowledge to apply the concepts of basic sciences in a particular area of physics.
3. Gain the ability to perform analysis, design and evaluation of physics problem.
4. Work independently on the research project under the supervision of academic member or staff, and should be able to design experiments to answer the particular question posed, and critically analysed the results. There will be scope for initiative in this element of the project.
5. Be able to set the work in the context of work done by other experimentalists, and provide a concise summary of relevant literature.
6. Acquire all the necessary skills to work in relevant work field.
7. Apply all the knowledge gained from previous course in relevant work settings.
8. Develop interpersonal skills / work under pressure / solve work related problems.
9. Improve skills to work independently and in teamwork.

3.Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge:**	
1.1	brief summary of , how to perform a scientific research.	K1
1.2	description of research process	K1
1.3	Writing a scientific report	K1
2	**Skills:**	
2.1	Apply the laws of physics.	S1
2.2	Analyse the physical phenomena.	S2
2.3	Express the physical phenomena mathematically.	S2
2.4	Writing a scientific report.	S2
2.5	Doing small researches	S2
3	**Competence:**	
3.1	Work independently.	C1
3.2	The students learn independently and take up responsibility.	C2

C. Course Content

No	List of Topics	Contact Hours
1		
2		
3		
4		
5		
6		
7		
8		
9		
Total		

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
1.0	**Knowledge**		
1.1	brief summary of , how to perform a scientific research.	• Each student will do his project under the supervision of a staff member. • At the end of the project, student should write a scientific report. • The student should give an oral presentation at the end of the semester.	• Writing a report. • Oral presentation
1.2	description of research process		
1.3	Writing a scientific report		
2.0	**Skills**		
2.1	Apply the laws of physics.	reparing main outlines for teaching	1- Writing a report 2- Oral presentation
2.2	Analyse the physical phenomena.		
2.3	Express the physical phenomena mathematically.		
2.4	Writing a scientific report.		
2.5	Doing small researches		
3.0	**Competence**		
3.1	Work independently.	1- Search through the internet and use the library. 2- Lab work. 3- Case Study. 4- Small group discussion. 5- Enhance educational skills. 6- Develop their interest in Science through :(lab work, field trips, visits to	• Evaluate the efforts of each student in preparing the report. • Evaluate the scientific values of reports. • Evaluate the work in team
3.2	The students learn independently and take up responsibility.		

Code	Course Learning Outcomes	TeachingStrategies	AssessmentMethods
		scientific and research. 7- Encourage the student to attend lectures regularly Give students tasks of duties	• Evaluation of the role of each student in lab group assignment • Evaluation of students presentations

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Scientific activities	All weeks	10 %
2	Collection of Data	All week	10 %
3	Doing a research	All week	20%
4	Writing report	13th weeks	50%
5	Final oral presentation	14th week	10%
6			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

Each student will supervise by academic adviser in physics Department and the time table for academic advice were given to the student each semester.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Class room • Library • Laboratory
Technology Resources (AV, data show, Smart Board, software, etc.)	

Item	Resources
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	• Computer room • Scientific calculator.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
1. Questionaries	another staff member	Revision of student report by another staff member.
2. Open discussion at the end of the lectures	Instructor	Analysis the grades of students.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes,Quality oflearning resources, etc.)
Evaluators (Students,Faculty, Program Leaders,Peer Reviewer, Others (specify)
Assessment Methods(Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	