هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**General Physics 1**
Course Code:	**PHY1001-4**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours: **4 (3+1)**							
2. Course type							
a.	University		College	√	Department		Others
b.	Required	√	Elective				
3. Level/year at which this course is offered: **Level 1st/ 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	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others**	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principles of general physics, such as measurements, vectors, Motion in one dimension, Newton's laws, work and energy. The course will also provide a conceptual background of experimental 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, length, time, and weight.
2. Differentiate between the vectors and the scalars
3. Calculate the vectors sum, and vectors product.
4. Define the concepts of force and gravity.

5. Apply Newton's laws of motion to calculate the position, velocity and acceleration.
6. Differentiate between Work, Energy, and power.

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

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and understanding**	
1.1	Define the physical quantities related to the measurement, motion in one dimension, vectors, Newton's law of motion, work and energy .	K1
1.2	Describe the concepts and physical laws related to the measurement, motion in one dimension, vectors, Newton's law of motion, work and energy using the mathematical formula.	K2
1.3		
2	**Skills:**	
2.1	Apply physics laws to calculate physical quantities related to the measurement, motion in one dimension, vectors, Newton's law of motion, work and energy.	S1
2.2	Explain the procedures for scientific theoretical treatments as well as empirical observations.	S2
2.3		
3	**Values:**	
3.1	Work effectively responsibly in teamwork	V2
3.2		

C. Course Content

No	List of Topics	Contact Hours
1	**Measurement** ● Measuring Things ● The International System of Units ● Changing Units ● Length ● Significant Figures and Decimal Places ● Time ● Mass	**5**
2	**Motion Along a Straight Line** ● Position, Displacement, and Average Velocity ● Motion ● Position and Displacement ● Average Velocity and Average Speed ● Instantaneous Velocity and Speed ● Acceleration ● Constant Acceleration: A Special Case ● Another Look at Constant Acceleration ● Free-Fall Acceleration ● Graphical Integration in Motion Analysis	**5**
3	**Vectors** ● Vectors and Their Components ● Vectors and Scalars ● Adding Vectors Geometrically ● Components of Vectors	**5**

	• Unit Vectors Adding Vectors by Components • Vectors and the Laws of Physics • Multiplying Vectors	
4	**Motion in Two and Three Dimensions** • Position and Displacement • Position and Displacement • Average Velocity and Instantaneous Velocity • Average Acceleration and Instantaneous Acceleration • Projectile Motion • Uniform Circular Motion • Relative Motion in One Dimension • Relative Motion in Two Dimensions	**5**
5	**Force and Motion-I** • Newtonian Mechanics • Newton's First Law • Force • Mass • Newton's Second Law • Some Particular Forces • Newton's Third Law • Applying Newton's Laws	**5**
6	**Force and Motion-II** • Friction • Properties of Friction • The Drag Force and Terminal Speed • Uniform Circular Motion Forces	**5**
	Practical Part: • Students will conduct various experiments in the practical part of the course. Each student will perform the experiment, collect data, extract result, and prepare a written report every week.	**10**
Total		40

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 and Understanding**		
1.1	Define the physical quantities related to the course.	1. Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: • Board, Power point. • Discussions • Brain storming • Start each chapter by general idea and the benefit of it. 4. Do some experimental in the Laboratory	1. Solve some examples during the lecture. 2. Discussions during the lectures 3. Exams: a) Quizzes. b) Midterm exams. c) Final exam. d) Practical exams.
1.2	Describe the concepts and physical laws related to the course using the mathematical formula.		
1.3			

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.0	**Skills**		
2.1	Apply physics laws to calculate physical quantities related to the course.	1. Solve some problems in physics during lectures. 2. Following some proofs during lectures. 3. Encourage students to participate in solving problems.	1. Solve some examples during the lecture. 2. Discussions during the lectures 3. Exams: a) Quizzes. b) Midterm exams. c) Final exam. d) Practical exams.
2.2	Explain the procedures for scientific theoretical treatments as well as empirical observations.		
2.3			
3.0	**Values**		
3.1	Work effectively responsibly in teamwork	• Give students tasks of duties. • Organize the students as a small group in the lab.	• Evaluate the scientific reports. • Discussing the reports with each teamwork. • Evaluate the efforts of each student in preparing the report.
3.2			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam	7th	20 %
2	HomeWorks & Quizzes	All weeks	10 %
3	Practical Exam	End of the semester	20 %
4	Final Exam	End of the semester	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 be supervised by academic adviser in Physics Department and the time table for academic advice were given to the student each semester. (4 hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Halliday & Resnick, Jearl Walker, "Fundamentals of Physics" 10th Edition (2018)
Essential References Materials	Physics for Scientists & Engineers with Modern Physics 4th Edition by Douglas Giancoli, 4th Edition (2014).
Electronic Materials	1. Physics is Beautiful | Free, interactive physics lessons 2. Khan Academy Physics | Physics videos 3. The Feynman Lectures on Physics 4. PhET Simulations | Online physics simulations

Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classroom • Laboratory • Library
Technology Resources (AV, data show, Smart Board, software, etc.)	• Data show • Black Bord
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	Questionnaire
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	
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	Introduction to Calculus
Course Code:	MTH1101-4
Program:	BSc. in Mathematics
Department:	Mathematical sciences
College:	Applied sciences
Institution:	Umm Al-Qura University

Table of Contents

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:	First level/First year							
4. Pre-requisites for this course (if any)**:**	None							
5. Co-requisites for this course (if any)**:**	Not applicable							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	Four hours/week	%100
2	Blended	.	.
3	E-learning	.	.
4	Distance learning	.	.
5	Other	.	.

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	36
2	Laboratory/Studio	0
3	Tutorial	0
4	**Others** (Exam, Quizzes, Activities,…)	6
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

This introductory calculus course covers differentiation and integration of functions of one variable. It is the first in a three-course sequence of calculus. Key topics of the course include precalculus, limits and continuity, derivatives, integrals.

2. Course Main Objective

The primary objective of the course is to introduce students to the concepts of calculus and to develop the student's confidence and skill in dealing with mathematical expressions. To achieve this goal, the course will help the student understand the following basic concepts: limits, continuity , derivatives and integration involving real-valued functions of one variable (including algebraic and trigonometric functions).

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding: by the end of this course, the student is expected to be able to**	

	CLOs	Aligned PLOs
1.1	Recognize the characteristics of a function expressed in symbolic or graphic form.	
1.2	Outline the definitions of limits and continuity of a single-variable function and related theorems.	
1.3	Define the basic concept of a derivative of a single-variable function and learn the different rules, formulas and theorems for computing the derivative of a function in calculus.	
1.4	Define the basic concepts and techniques of integration of polynomial, rational, and trigonometric functions.	
2	**Skills: by the end of this course, the student is expected to be able to**	
2.1	Analyze functions represented in a variety of ways: graphical, numerical or analytical	
2.2	Determine the limits of functions and their continuity at points or on intervals.	
2.3	Calculate the derivative of various type of functions using the rules and techniques of differentiation.	
2.4	Evaluate integrals of real functions using basic rules and techniques of integration.	
3	**Values: by the end of this course, the student is expected to be able to**	
3.1	Apply the computational and conceptual principles of calculus to the solutions of various mathematical problems.	
3.2	Justify the choice of different steps in problem resolution procedure.	
3.3	Solve problems using a range of formats and approaches in basic science.	
3.4	Show the ability to work independently and within groups.	

C. Course Content

No	List of Topics	Contact Hours
1	**Pre Calculus:** (i) Exponents and Radicals. (ii) Solving Equations. (iii)Inequalities and Absolute Values. (iv)Lines	8
2	**Functions** (i) Functions: Definition, Graphs and Operations (ii) Trigonometric Functions and Identities.	4
3	**Limits and Continuity:**	8

	(i) Introduction to Limits (ii) Theorems on limits (iii) Limit at infinity and infinite limits (iv) Continuity	
4	**Differentiation** (i) Definition of Derivative (Using Limits) (ii) Rules and Theorems for Finding Derivatives (iii)Derivative of Trigonometric Function (iv)Chain Rule (v) Higher Order Derivatives	10
5	**Integration** (i) Antiderivatives. (ii) Fundamental Theorems of Calculus.	4
6	**Others** Preprimaries, Quizzes, Activities …	6
	Total	40

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 and Understanding**		
1.1	Recognize the characteristics of a function expressed in symbolic or graphic form.	Lecture and Tutorials	Exams, quizes
1.2	Outline the definitions of limits and continuity a single-variable function and related theorems.	Lecture and Tutorials	Exams, quizes
1.3	List the different rules, formulas and theorems for computing derivatives of functions.	Lecture and Tutorials	Exams, quizes
1.4	Define the basic concepts and techniques of integration of polynomial, rational, and trigonometric functions.	Lecture and Tutorials	Exams, quizes
2.0	**Skills**		
2.1	Analyze functions represented in a variety of ways: graphical, numerical or analytical.	Lecture/Individual or group work	Exams, quizes
2.2	Determine the limits of functions and their continuity at points or on intervals.	Lecture/Individual or group work	Exams, quizes
2.3	Calculate the derivative of various type of functions using the rules and	Lecture/Individual or group work	Exams, quizes

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	techniques of differentiation.		
2.4	Apply the concept of derivative to completely analyze graph of a function.	Lecture/Individual or group work	Exams, quizes
2.5	Evaluate integrals of real functions using basic rules and techniques of integration.	Lecture/Individual or group work	Exams, quizes
3.0	**Values**		
3.1	Apply the computational and conceptual principles of calculus to the solutions of various mathematical problems.	Lecture/Individual or group work	Exams, quizes
3.2	Justify the choice of different steps in problem resolution procedure.	Lecture/Individual or group work	Exams, quizes
3.3	Solve problems using a range of formats and approaches in basic science.	Lecture/Individual or group work	Exams, quizes
3.4	Show the ability to work independently and within groups.	Lecture/Individual or group work	Exams, quizes

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm exam	Sixth week	30%
2	Quizes and homeworks	During semester	20%
3	Final exam	End of semester	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 :

All faculty members are required to be in their offices outside teaching hours. Each member allocates at least 4 hours per week to give academic advice to students and to better explain the concepts seen during the lectures.

Students are required to complete the homework problems. Students are welcome to work together on homework. However, each student must turn in his or her own assignments, and no copying from another student's work is permitted. Deadline extensions for homework will not be given. Students are encouraged to discuss with professor about homework problems.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Calculus (9th Edition), Dale Varberg, Edwin Purcell and Steven Rigdon, Prentice Hall (2006).
Essential References Materials	• Thomas' Calculus (14th Edition), George B. Thomas • Precalculus: Mathematics for Calculus (6th Edition), James Stewart

Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show, Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Direct
Quality of learning resources	Students	Direct
Extent of achievement of course learning outcomes	Faculty Member	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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Linear Algebra (1)**
Course Code:	**MTH3211-4**
Program:	**BSc. in Mathematics**
Department:	**Mathematical science**
College:	**Applied science**
Institution:	**Umm Al-Qura University**

Table of Contents

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: Third level/First year	
4. Pre-requisites for this course (if any)**:** Foundation of Mathematics	
5. Co-requisites for this course (if any)**:** Non	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	Four hours/week	%١٠٠
2	Blended	٠	٠
3	E-learning	٠	٠
4	Distance learning	٠	٠
5	Other	٠	٠

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	40
2	Laboratory/Studio	0
3	Tutorial	10
4	**Others** (specify)	0
	Total	50

B. Course Objectives and Learning Outcomes

1. Course Description

Linear Algebra is an area of mathematics that deals with the properties and applications of vectors, matrices, and other related mathematical structures. Interestingly, these topics readily lend themselves to a very rigorous study of the underlying mathematical theory, as well as to a broadly applications-oriented study of concepts, methods, and algorithms. This course will place roughly equal emphasis on theory and applications.

Main topics we will cover include linear systems and their solutions, matrix, determinants, vector space, linear transformation, eigenvalues and eigenvectors. We will study a variety of interdisciplinary applications and related strategies throughout the course.

2. Course Main Objective

The first goal of the course is to teach students how to use linear algebra as a powerful tool for computation. The second goal is to show how these computations can be conceptualized in a geometric framework. The final goal is to give a gentle introduction to the theory of abstract vector spaces.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding: by the end of this course, the student is expected to be able to**	
1.1	Identify systems of linear equations	
1.2	State Row reduction and echelon forms	
1.3	Describe the different matrix operations	
1.4	Memorize determinants and their properties	
1.5	Outline vector and sub-vector spaces and their properties	
1.6	Name bases and dimension of vector spaces	
2	**Skills: by the end of this course, the student is expected to be able to**	
2.1	Write a system of linear equations in matrix form	
2.2	Determine whether a system of linear equations is consistent or inconsistent	
2.3	Perform matrix operations and solve matrix equations	
2.4	Calculate an eigenvalue and an eigenvector of a given matrix	
2.5	Determine whether a given matrix is diagonalizable, symmetric	
3	**Values: by the end of this course, the student is expected to be able to**	
3.1	Analyze quantitative data verbally, graphically, symbolically and numerically	
3.2	Communicate quantitative data verbally, graphically, symbolically and numerically	
3.3	Integrate appropriately technology into mathematical processes	
3.4	Generalize mathematical concepts in problem-solving through integration of new material and modeling	

C. Course Content

No	List of Topics	Contact Hours
1	System of linear equations in a linear algebra: systems of linear equations, consistent and inconsistent systems of linear equations, Gaussian Elimination and Gauss-Jordan Elimination of linear equations.	4
2	Matrix Algebra: Matrix operations, properties of matrix operations, the inverse of a matrix (invertible matrix theorem), elementary matrices.	8
3	Determinants of square matrices: definition of determinants, evaluation of a determinant using elementary operations, properties of determinants. Applications of determinants: the inverse of a matrix by its adjoint, Cramer's rule and volume.	8

4	Vector spaces: Vectors in $\mathbb{R}^2, \mathbb{R}^3, \dots, \mathbb{R}^n$, definition of vector space, subspaces, linearly independence, basis and dimensions, rank of a matrix, coordinate and change basis.	12
5	Inner product spaces: definition of inner product space and examples	2
6	Linear transformation: definition of linear transformation, kernel and image of linear transformation and isomorphism of vector spaces.	4
7	Eigen values and eigen vectors: Definitions and examples	2
Total		٤٠

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 and Und0erstanding**		
1.1	Identify systems of linear equations	Lecture and Tutorials	Exams, quizzes
1.2	State Row reduction and echelon form	Lecture and Tutorials	Exams, quizzes
1.3	Describe the different matrix operations	Lecture and Tutorials	Exams, quizzes
1.4	Memorize determinants and their properties	Lecture and Tutorials	Exams, quizzes
1.5	Outline vector and sub-vector spaces and their properties	Lecture and Tutorials	Exams, quizzes
1.6	Name bases and dimension of vector spaces	Lecture and Tutorials	Exams, quizzes
2.0	**Skills**		
2.1	Write a system of linear equations in matrix form	Lecture/Individual or group work	Exams, quizzes, Homework
2.2	Determine whether a system of linear equations is consistent or inconsistent.	Lecture/Individual or group work	Exams, quizzes, Homework
2.3	Perform matrix operations and solve matrix equations.	Lecture/Individual or group work	Exams, quizzes, Homework
2.4	Find the determinants of a matrix in many ways.	Lecture/Individual or group work	Exams, quizzes, Homework
2.5	Calculate an eigenvalue and an eigenvector of a given matrix	Lecture/Individual or group work	Exams, quizzes, Homework
2.6	Determine whether a given matrix is Diagonalizable, symmetric or orthogonal	Lecture/Individual or group work	Exams, quizzes, Homework
3.0	**Values**		
3.1	Analyze quantitative data verbally, graphically, symbolically and numerically	Lecture/Individual or group work	Exams, quizzes, research essays
3.2	Communicate quantitative data verbally, graphically, symbolically and numerically	Lecture/Individual or group work	Exams, quizzes, research essays
3.3	Integrate appropriately technology into mathematical processes	Lecture/Individual or group work	Exams, quizzes, research essays

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.4	Generalize mathematical concepts in problem-solving through integration of new material and modeling	Lecture/Individual or group work	Exams, quizzes, research essays

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm exam	Sixth week	%30
2	Quizzes, homework, and research essays	During semester	%٢٠
4	Final exam	End of semester	%٥٠

***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:

All faculty members are required to be in their offices outside teaching hours. Each member allocates at least 4 hours per week to give academic advice to students and to better explain the concepts seen during the lectures.

Students are required to complete the homework problems. Students are welcome to work together on homework. However, each student must turn in his or her own assignments, and no copying from another student's work is permitted. Deadline extensions for homework will not be given. Students are encouraged to discuss with professor about homework problems.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• R. Larson, B. Edwards and D. Falvo, Elementary Linear Algebra, Houghton Mifflin Harcourt, 6th edition ,2009. • T. S. Blyth and E. F. Robertson, Basic Linear Algebra, Springer, London, 1998.
Essential References Materials	• T. David, Guide to linear algebra. Macmillan International Higher Education, 1988. • G. Strang, Introduction to Linear Algebra. 5th Edition. Wellesley, MA: Wellesley-Cambridge Press, 2016.
Electronic Materials	https://en.wikipedia.org/wiki/Linear_algebra
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Large classrooms that can accommodate more than 30 students
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show, Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Direct
Quality of learning resources	Students	Direct
Extent of achievement of course learning outcomes	Faculty Member	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	Prof. Dr. Ahmad Mohammed Alghamdi and Eman Allugmani and Amani Alkatheri
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	English Language 1
Course Code:	7001-3-101-4
Program:	Bachelor in Non-EMI Colleges (College of Applied Sciences, College of Islamic Economics and Finance, Department of Islamic Architecture)
Department:	English Language Centre
College:	English Language Centre
Institution:	Umm Al Qura University

Table of Contents

A. Course Identification

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

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	6 hours per week	60%
2	**Blended**	10 hours per week	100%
3	**E-learning**	4 hours per week	40%
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	(10 hours) X (10 weeks)
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	100 hours

B. Course Objectives and Learning Outcomes

1. Course Description English Language I (7001-3-101-4) is a single-level, English for General Purposes (EGP) course. All students who are admitted to Bachelor in the Non-EMI Colleges (College of Applied Sciences, College of Islamic Economics and Finance, Department of Islamic Architecture) are required to take this course in the first semester of the first year of their program. The course is offered in 10 weeks with a 10-hour-per week teaching plan covering the four language skills. It intends to develop students' knowledge and ability of English language in all major skills which include reading, writing, listening, and speaking, as well as in sub-skills including grammar, vocabulary, and pronunciation.
2. Course Main Objective English Language 1 is a basic level taking students from (CEFR) A1 to A2.

3. Course Learning Outcomes

CLOs	
1.0	**Knowledge**
1.1	**By the end of the course, the students are expected to be able to:** exhibit adequate comprehension of spoken materials at the A2 level through recognizing key words and simple changes in topic. - understand the main ideas of conversations, presentations, radio programmes, news reports, podcasts, and interviews - understand how to listen for detail in academic study - understand the use of repetition for clarification - understand a speaker's mood from intonation - understand a speaker's attitude to a topic - distinguish fact from opinion - recognize features of connected speech, eg single sounds, intrusives, stress patterns, etc
1.2	demonstrate basic understanding of grammar at the A2 level. - use the present simple to describe habits and routines - be aware of the use of formal vs informal language when making requests, writing email, etc - use the past simple and past continuous when describing events in someone's life with correct time clauses where needed - use the present continuous to describe actions happening at the time of speaking or when discussing future plans - use *going to* when talking about persona plans or intentions - correctly use quantifiers, such as *too much* - be aware of the difference in use of *to* and *for* when giving reasons - use comparatives and superlatives for comparing people and objects - make predictions using *will, may* or *might* where appropriate - use present perfect to talk about experience or lack of it - use relative clauses with *who, which* or *that*
1.3	recognize and use lexical items such as words, collocations related to everyday topics at the A2 level: - develop vocabulary of the topics covered in order to be able to talk about them with others - be able to combine clauses using *and* and *but* - understand and use basic collocations with *have, make* and *do* - write short texts, eg making comments on podcast chat or online discussions, or giving online travel advice
2.0	**Skills**
2.1 2.1.1	**Cognitive Skills:** demonstrate comprehension of simple written texts at the A2 level through applying the skills of scanning, skimming, and guessing from context. - develop scanning (to find information quickly) and skimming skills (to predict the meaning of the text from visuals, titles or common words) - identify the author or speaker's audience and purpose - listen or read for opinions, attitude, and identify fact from opinion - understand meaning from context in both written and spoken texts
2.1.2	compose simple and basic texts at the A2 level about everyday topics through applying the skills of brainstorming ideas, composing an outline, and editing/revision. - write a formal email of introduction - post comments online with reasons and/or examples - posting text msgs vs writing an email - brainstorm and write points on presentation slides with correct format (parallelism) - write an announcement and comment on it - research a famous person, make notes, and produce a short paragraph from them - write a vlog script - write combined sentences, using *and* and *but* - use sequencers: *first, then, next, etc* - punctuation: Capital letters, commas, periods.

CLOs	
2.1.3	communicate in spoken language at the A2 level through simple tasks such as direct exchange of information, delivering short talks - talk about familiar topics - use functional language, such as greetings, inviting, expressing surprise, etc - give short presentations - produce a short vlog and video - check understanding
2.2	**Critical Thinking** - consider how people feel and think when meeting someone for the first time - analyze a text regarding main ideas in paragraphs - identify and discuss the habits of successful people - identify the pros and cons of a topic - identify a person's attitude or feelings based on what they have said - identify solutions to a problem - identify the purpose of a text based on its content - form an opinion based on input, eg an article - separate fact from fiction - identify reasons people take some action and problems they may have - evaluate a classmate's writing based on criteria provided - identify the difference between fact and fiction in advertisements - identify different points of view - identify use of register/ formality - reflect on how knowledge helps comprehension - reflect on knowledge gained - make predictions based on present knowledge
2.3	**Communication, Information Technology, Numerical** - provide basic, prepared information - describe and give personal opinions on a variety of topics - give advice, eg on travel - express general beliefs - talk about advantages and disadvantages - give recommendations - present persuasively
2.4	**Psychomotor** - give confident, persuasive presentations - design slides for a presentation with appropriate parallelism - use linking and weak forms in sentences
3.0	**Values**
3.1	develop life-long learning strategies so that students can take full responsibility of their English language skill development.
3.2	develop academic integrity.
3.3	collaborate in knowledge building and co-operate with peers: - hold short discussions with a partner to activate knowledge before listening tasks - hold short discussions with a partner to synthesize knowledge post-listening - work with others to develop a plan, create a convincing argument - give feedback to peers on writing, presentations, etc - use intonation to show emotion and interest - show levels of agreement *"I agree", "I guess"* - ask for opinions and check information
3.4	take the responsibilities to meet the requirements of the jobs market: - consider research needed before a job application - write a formal letter of self-introduction - be aware of the importance of first impressions

C. Course Content

No	List of Topics	Contact Hours
	Evolve: Level 2 (A2) Special Edition	
1	Unit 1: Connections Family, possessions, greetings, email, first impressions, things in common Video: Friends for dinner	
2	Unit 2: Work and Study Routines, work or study space, explaining a problem, podcasts, smartphones, the Internet, useful apps Video: Monday morning problems	
3	Unit 3: Let's move Sport and exercise, asking for info, bike sharing, attitudes to keeping fit, a fitness program Video: At the gym	
4	Unit 4: Good times Comic Con, gifts, invitations, Bug Fest, National Day and national dishes Video: A surprise party	
5	Unit 5: Firsts and lasts A day in your life, events in your life, congratulating and sympathizing, first impressions, migration, the Titanic Video: A photo album	
6	Unit 6: Buy now, pay later Back Friday, shopping habits, discovering new words, money, online shopping advice, inventions Video: An online shopping problem	
7	Unit 7: But first, food Comfort food, street food, ordering, meat-free burgers, vegan food, celebrating Video: Eating out	
8	Unit 8: Trips Trip advice, A short trip, making suggestions, living abroad, a trip to Riyadh, planning a trip Video: Lost in the city	
9	Unit 9: Looking good What to wear, family photos, giving opinions, images in ads, recycling, advertisements Video: An untidy guest	
10	Unit 10: Risky business Dangers at work, health, fears, the future: yourself and work, TV shows Video: A 911 call	
11	Unit 11: Me, online Personal achievements, social media, requesting, selfies, Internet of Things (IoT), online videos Video: Getting a job	
12	Unit 12: Outdoors The weather, describing places, getting lost, guerilla gardening, writing a trip review, a tourism campaign Video: Changes	
	Total	

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	**By the end of the course, the students are expected to be able to:** exhibit adequate comprehension of spoken materials at the A2 level. - understand the main ideas of conversations, presentations, radio programmes, news reports, podcasts, and interviews - understand how to listen for detail in academic study - understand the use of repetition for clarification - understand a speaker's mood from intonation - understand a speaker's attitude to a topic distinguish fact from opinion - recognize features of connected speech, eg single sounds, intrusives, stress patterns, etc	Listening exercises	Listening mid-term exam Listening final exam
1.2	demonstrate basic understanding of grammar at the A2 level. - use the present simple to describe habits and routines - be aware of the use of formal vs informal language when making requests, writing email, etc - use the past simple and past continuous when describing events in someone's life with correct time clauses where needed - use the present continuous to describe actions happening at the time of speaking or when discussing future plans -use *going to* when talking about persona plans or intentions - correctly use quantifiers, such as *too much* - be aware of the difference in use of *to* and *for* when giving reasons - use comparatives and superlatives for comparing people and objects - make predictions using *will, may* or *might* where appropriate - use present perfect to talk about experience or lack of it - use relative clauses with *who, which* or *that*	Grammar exercises	Midterm Exam Continuous writing assessment Continuous speaking assessment Quizzes Writing Final Exam Final Exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.3	recognize and use lexical items such as words, collocations related to everyday topics at the A2 level: - develop vocabulary of the topics covered in order to be able to talk about them with others - be able to combine clauses using *and* and *but* - understand and use basic collocations with *have*, *make* and *do* - write short texts, eg making comments on podcast chat or online discussions, or giving online travel advice	Writing, reading, and vocabulary exercises	Midterm Exam Continuous writing assessment Continuous speaking assessment Quizzes Writing Final Exam Final Exam
2.0	**Skills**		
2.1 2.1.1	**Cognitive Skills:** demonstrate comprehension of simple written texts at the A2 level through applying the skills of scanning, skimming, and guessing from context. - develop scanning (to find information quickly) and skimming skills (to predict the meaning of the text from visuals, titles or common words) - identify the author or speaker's audience and purpose - listen or read for opinions, attitude, and identify fact from opinion - understand meaning from context in both written and spoken texts	Reading comprehension exercises	Classroom discussion Midterm exam Final exam
2.1.2	compose simple and basic texts at the A2 level about everyday topics through applying the skills of brainstorming ideas, composing an outline, and editing/revision. - write a formal email of introduction - post comments online with reasons and/or examples - posting text msgs vs writing an email - brainstorm and write points on presentation slides with correct format (parallelism) - write an announcement and comment on it - research a famous person, make notes, and produce a short paragraph from them - write a vlog script - write combined sentences, using and and but - use sequencers: first, then, next, etc - punctuation: Capital letters, commas, periods.	Writing exercises	Continuous writing assessment Writing Final Exam
2.1.3	communicate in spoken language at the A2 level through simple tasks such as direct exchange of information, delivering short talks - talk about familiar topics - use functional language, such as greetings, inviting, expressing surprise, etc - give short presentations - produce a short vlog and video	Speaking exercises Discussion Presentation, eg an advertisement, a tourist campaign, a YouTube video	Continuous speaking assessment

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	- check understanding		
2.2	**Critical Thinking** - consider how people feel and think when meeting someone for the first time - analyze a text regarding main ideas in paragraphs - identify and discuss the habits of successful people - identify the pros and cons of a topic - identify a person's attitude or feelings based on what they have said - identify solutions to a problem - identify the purpose of a text based on its content - form an opinion based on input, eg an article separate fact from fiction - identify reasons people take some action and problems they may have - evaluate a classmate's writing based on criteria provided - identify the difference between fact and fiction in advertisements - identify different points of view - identify use of register/ formality - reflect on how knowledge helps comprehension - reflect on knowledge gained - make predictions based on present knowledge	Discussion Q & A	
2.3	**Communication, Information Technology, Numerical** - provide basic, prepared information - describe and give personal opinions on a variety of topics - give advice, eg on travel - express general beliefs - talk about advantages and disadvantages - give recommendations present persuasively	Demonstrations Active self-learning Pair work Group work e-learning Online material (Encourage students to make their presentations to small groups in the class)	Monitoring students' progress Evaluating the individual contribution Evaluating the teamwork Evaluating the final product (Evaluation of presentations may be by peers)

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.4	**Psychomotor** - give confident, persuasive presentations - design slides for a presentation with appropriate parallelism - use linking and weak forms in sentences	Active self-learning Pair work Group work	Monitoring students' progress
3.0	**Values**		
3.1	develop life-long learning strategies so that students can take full responsibility of their English language skill development.	Cambridge application Cambridge LMS	Built-in immediate feedback
3.2	develop academic integrity.	Writing exercises	Continuous writing assessment Continuous speaking assessment Writing Final Exam
3.3	collaborate in knowledge building and co-operate with peers: - hold short discussions with a partner to activate knowledge before listening tasks - hold short discussions with a partner to synthesize knowledge post-listening - work with others to develop a plan, create a convincing argument - give feedback to peers on writing, presentations, etc - use intonation to show emotion and interest - show levels of agreement *"I agree", "I guess"* - ask for opinions and check information	Peer work Group work	Evaluating the individual contribution Evaluating the teamwork Evaluating the final product
3.4	take the responsibilities to meet the requirements of the jobs market: - consider research needed before a job application - write a formal letter of self-introduction - be aware of the importance of first impressions	Individual, peer and group work inside classrooms. Extramural language work to master the competencies at this language level.	Monitoring students' progress

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam	The 5th	30
2	Listening Mid-term Exam	The 6th	5
3	Online Practice	from the 1st to the 10th	5
4	Continuous speaking assessment	from the 1st to the 10th	5
5	3 Quizzes (average)	3rd/ 6th/ 9th	5
6	Listening Final Exam	from the 1st to the 10th	5
7	Final Exam	The 10th	45
	Total	The 11th	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:

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Clandfield, L., Goldstein, B., Jones, C., Kerr, P., Hendra, L., Tilbury, A. (2019). Evolve 2: Special Edition. Student's Book with Practice Extra. Cambridge University Press. UK: Cambridge University Press.
Essential References Materials	Multimedia
Electronic Materials	Cambridge LMS
Other Learning Materials	

2. Facilities Required

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

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources.	Faculty members	Direct: Course reports
Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources.	University students	Direct: Evaluation surveys

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	Curriculum and Accreditation Committees
Reference No.	
Date	Dec 30.2021

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**General Physics 2**
Course Code:	**PHY1002-4**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

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 2nd / 1st year	
4. Pre-requisites for this course (if any)**: General 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**	40	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others**	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of mechanics, such as particle dynamics, system of particles, collisions, rotational kinematics, rotational dynamics, fluid mechanics, etc.

2. Course Main Objective

After completing this course student should be able to:

1. Define the concepts of the work and potential energy.
2. Define the concepts of the center of mass.
3. Define the concepts of motion of a circular path.
4. Define the concepts of torque and angular momentum.
5. Define the concepts of the gravitational.

6. Define the concepts of the fluid mechanics.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the physical quantities related to the mechanics of the body, as well as fluid mechanics.	K1
1.2	Describe the concepts and physical laws related to mechanics of the body as well as the fluid mechanics using the mathematical formula.	K2
1.3		
2	**Skills:**	
2.1	Apply physics laws to calculate physical quantities related to the mechanics of the body as well as the fluid mechanics.	S1
2.2	Explain the procedures for scientific theoretical treatments.	S2
2.3		
3	**Values:**	
3.1	Work effectively responsibly in teamwork	V2
3.2		

C. Course Content

No	List of Topics	Contact Hours
1	**Kinetic Energy and Work** • What is Energy? • Kinetic Energy • Work • Work and Kinetic Energy • Work Done by the Gravitational Force • Work Done by a Spring Force • Work Done by a General Variable Force • Power	**5**
2	**Potential Energy and Conservation of Energy** • Work and Potential Energy • Path Independence of Conservative Forces • Determining Potential Energy Values • Conservation of Mechanical Energy • Reading a Potential Energy Curve • Work Done on a System by an External Force • Conservation of Energy	**5**
3	**Center of Mass and Linear Momentum** • The Center of Mass • Newton's Second Law for a System of Particles • Linear Momentum • The Linear Momentum of a System of Particles • Collision and Impulse • Conservation of Linear Momentum • Momentum and Kinetic Energy in Collisions • Inelastic Collisions in One Dimension • Elastic Collisions in One Dimension • Collisions in Two Dimensions • Systems with Varying Mass: A Rocket	**5**

4	**Rotation** ● Rotational Variables ● Are Angular Quantities Vectors? ● Rotation with Constant Angular Acceleration ● Relating the Linear and Angular Variables ● Kinetic Energy of Rotation ● Calculating the Rotational Inertia ● Torque ● Newton's Second Law for Rotation ● Work and Rotational Kinetic Energy	**5**
5	**Rolling, Torque, and Angular Momentum** ● Rolling as Translation and Rotation Combined ● The Kinetic Energy of Rolling ● The Forces of Rolling ● The Yo-Yo ● Torque Revisited ● Angular Momentum ● Newton's Second Law in Angular Form ● The Angular Momentum of a System of Particles ● The Angular Momentum of a Rigid Body Rotating About a Fixed Axis ● Conservation of Angular Momentum ● Precession of a Gyroscope	**5**
6	**Equilibrium and Elasticity** ● Equilibrium ● The Requirements of Equilibrium ● The Center of Gravity ● Some Examples of Static Equilibrium ● Indeterminate Structures ● Elasticity	**5**
7	**Gravitation** ● Newton's Law of Gravitation ● Gravitation and the Principle of Superposition ● Gravitation Near Earth's Surface ● Gravitation Inside Earth ● Gravitational Potential Energy ● Planets and Satellites: Kepler's Laws ● Satellites: Orbits and Energy ● Einstein and Gravitation	**5**
8	**Fluids** ● What is a Fluid? ● Density and Pressure ● Fluids at Rest ● Measuring Pressure ● Pascal's Principle ● Archimedes' Principle ● Ideal Fluids in Motion ● The Equation of Continuity ● Bernoulli's Equation	**5**
Total		40

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 and Understanding**		
1.1	Define the physical quantities related to the mechanics of the body.	1. Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: • Board, Power point. • Discussions • Brain storming • Start each chapter by general idea and the benefit of it. 4. Do some experimental in the Laboratory	1. Solve some examples during the lecture. 2. Discussions during the lectures 3. Exams: a) Quizzes. b) Midterm exams. c) Final exam. d) Practical exams.
1.2	Describe the concepts and physical laws related to mechanics using the mathematical formula.		
2.0	**Skills**		
2.1	Apply physics laws to calculate physical quantities related to the mechanics of the body.	1. Solve some problems in physics during lectures. 2. Following some proofs during lectures. 3. Encourage students to participate in solving problems.	1. Solve some examples during the lecture. 2. Discussions during the lectures 3. Exams: a) Quizzes. b) Midterm exams. c) Final exam. d) Practical exams.
2.2	Explain the procedures for scientific theoretical treatments.		
3.0	**Values**		
3.1	Work effectively responsibly in teamwork	• Organize the students as a small group (teamwork). • Give students tasks of duties as a small project.	• Evaluate the scientific reports. • Discussing the reports with each teamwork. • Evaluate the efforts of each student in preparing the report..
3.2			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam	7th	30 %
2	HomeWorks & Quizzes & reports	All weeks	20 %
3	Final Exam	End of the semester	50%
4			

***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 be supervised by academic adviser in Physics Department and the time table for academic advice were given to the student each semester. (4 hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Halliday & Resnick, Jearl Walker, "Fundamentals of Physics" 10th Edition (2018)
Essential References Materials	Physics for Scientists & Engineers with Modern Physics 4th Edition by Douglas Giancoli, 4th Edition (2014).
Electronic Materials	1. Physics is Beautiful | Free, interactive physics lessons 2. Khan Academy Physics | Physics videos 3. The Feynman Lectures on Physics 4. PhET Simulations | Online physics simulations
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classroom • Library
Technology Resources (AV, data show, Smart Board, software, etc.)	• Data show • Black Bord
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	Questionnaire
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	
Reference No.	

Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	General Chemistry 1
Course Code:	Chem1001
Program:	All Chemistry tracks - Industrial Chemistry – Physics - Medical Physics – Biology – Microbiology – Mathematics-Environmental
Department:	Department of chemistry
College:	Faculty of Applied Science/
Institution:	Umm Al-qura University

Table of Contents

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 1/ 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**	**3**	**100%**
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

This course is an introductory chemistry course designed to prepare students for college level chemistry courses.

2. Course Main Objective

The course introduces some basic principles of physical, organic and inorganic chemistry.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Familiar with the International system of units**	K1
1.2	**Write the electronic configuration of different elements**	K1

CLOs		Aligned PLOs
1.3	Familiar with the atomic structure	K1
1.4	List the factors affecting equilibrium position and equilibrium concentration.	K1
1.5	List the various types of chemical reaction	K1
1.6	Recognize and know which elements in the Periodic Table	K2
1.7	familiar with the terms hydrocarbons, organic compounds containing oxygen and nitrogen atoms	K2
2	**Skills :**	
2.1	Predict molecular formulas using empirical formulas and molecular masses.	S1
2.2	Explain trends in the Periodic Table as they relate to Atomic Size, Ionization Energy and Electron Affinity.	S1
2.3	Calculate the concentration of a solution from the volume and the mass, or moles, of solute	S1
2.4	Calculate the pH of acids and bases	S2
3	**Values:**	
3.1	Ability to communicate results of work to classmates.	V2
3.2	Communicate effectively with his lecturer and colleagues	V1

C. Course Content

No	List of Topics	Contact Hours
1	Units of measurements; SI- units, intensive and extensive properties, uncertainty in measurements (precision and accuracy). Introduction: Matter and measurements	2
2	Significant figures: Using significant figures in addition, subtraction, multiplication and divisions.	1
3	States of matter and measurement, molecules and molecular compounds.	2
4	The periodic table, electronic structure of atoms, simple periodic properties of the elements.	3
5	Stoichiometry, atomic and molecular weights.	3
6	The mole, simple quantitative calculations with chemical reactions.	4
7	Basics of chemical equilibrium.	6
8	Acids and bases.	3
9	Thermochemistry.	3
10	Chemistry of life: Organic and biological chemistry	3
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 and Understanding		
1.1	Familiar with the International system of units	• Lectures • Library visits Web-based study	Quiz. Exam. Class discussion.
1.2	Write the electronic configuration of different elements	• Lectures • Scientific discussion Web-based study	Quiz. Exam. Class discussion.
1.3	Familiar with the atomic structure	• Lectures • Scientific discussion Web-based study	Quiz. Exam. Class discussion.
1.4	Describe the mass relationships in chemical reactions	• Lectures • Library visits • Web-based study	Quiz. Exam. Class discussion.
1.5	List the factors affecting equilibrium position and equilibrium concentration.	• Lectures • Scientific discussion • Web-based study	Quiz. Exam. Class discussion.
1.6	List the various types of chemical reaction	• Lectures • Scientific discussion • Web-based study	Quiz. Exam. Class discussion.
1.7	Recognize and know which elements in the Periodic Table	• Lectures • Scientific discussion • Web-based study	Quiz. Exam. Class discussion.
1.8	familiar with the terms hydrocarbons, organic compounds containing oxygen and nitrogen atoms	• Lectures • Scientific discussion • Web-based study	Quiz. Exam. Class discussion.
2.0	Skills		
2.1	Predict molecular formulas using empirical formulas and molecular masses.	• Lectures • Scientific discussion Web-based study	Quiz. Exam. Class discussion.
2.2	Explain trends in the Periodic Table as they relate to Atomic Size, Ionization Energy and Electron Affinity.	• Lectures • Scientific discussion Web-based study	Quiz. Exam. Class discussion.
2.3	Calculate the concentration of a solution from the volume and the mass, or moles, of solute	• Lectures • Scientific discussion Web-based study	Quiz. Exam. Class discussion.
2.4	Calculate the pH of acids and bases	• Lectures • Scientific discussion Web-based study	Quiz. Exam. Class discussion.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.0	Values		
3.1	Demonstrate commitment to professional and academic values, and ethics in the field of chemistry	• Lectures • Scientific discussion	Class discussion. Assignment activities
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Class activities, Attendances and Duties	Throughout the Term	10%
2	Mid-Term Exam (s)	Week 6-8	20%
3	Lab Activity and Final Exam on Lab	Throughout the Term	30%
4	Final Exam.(2 hours exam)	End of the Term	40%
5	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 :

- **We have faculty members to provide counselling and academic advice.**
- **2 hours per week as office hours are available for discussion with the students.**

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	General Chemistry, by Chang, 9th ed., 2007, MacGraw-Hill.
Essential References Materials	Steven S. Zumdahl, Susan A. Zumdahl, 9th ed., 2009, New York.
Electronic Materials	Power point lectures.
Other Learning Materials	Course available online

2. Facilities Required

Item	Resources

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	**Classrooms.** **Providing hall of teaching aids including computers and projector.**
Technology Resources (AV, data show, Smart Board, software, etc.)	**Room equipped with computer and projector and TV**
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	**Students**	**Indirect (Online survey at the end of the semester (Program survey, Experience survey &course evaluation) .**
Effectiveness of teaching	**Faculty members**	**Direct (classroom observation using the Teaching Observation**
Achievement of course learning outcomes.	**Faculty members**	**Direct (60% of the students achieved ≥ 70% of the degree assigned to the course learning outcome).**
Assessment of faculty members	**Department head**	**Direct (Performance Assessment of faculty** **Indirect (feedback from faculty and students).**
Quality of learning resources	**Students**	**Direct (feedback from faculty).** **Indirect (online survey at the end of the semester.**
Effectiveness of teaching Strategies for Learning Outcomes.	**Faculty members**	**Direct (Comments of course instructors regarding evaluation of teaching strategies for learning outcomes mentioned in 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	Prof. Mohamed I. Awad
Reference No.	
Date	**15.03.2022**

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	Calculus
Course Code:	MTH1104-4
Program:	Physics
Department:	Mathematical sciences
College:	Applied sciences
Institution:	Umm Al-Qura University

Table of Contents

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: Second level/First year							
4. Pre-requisites for this course (if any)**:** Introduction to Calculus							
5. Co-requisites for this course (if any)**:** Not applicable							

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	Four hours/week	%100
2	Blended	0	0
3	E-learning	0	0
4	Distance learning	0	0
5	Other	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	40
2	Laboratory/Studio	0
3	Tutorial	0
4	**Others** (Exam, Quizzes, Activities,…)	0
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides an introduction to differential calculus and their application, as well as the definite integral and their applications.

2. Course Main Objective

After studying this course, the student will be able to:

- Find the inverse function and their derivatives.
- Calculate the derivative of various type of functions using some techniques of differentiation.
- Calculate integrals over infinite intervals
- Apply the definite integral in geometry and engineering

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding: by the end of this course, the student is expected to be able to**	
1.1	List formulas and theorems of differentiation of some real valued functions.	K1
1.2	Recall the relation between the derivative of a function and the derivative of its inverse	K1, K2
1.3	Defined the principles of integral evaluation	K1, K2
1.4		
2	**Skills: by the end of this course, the student is expected to be able to**	
2.1	Calculate the derivative of various type of functions using some techniques of differentiation.	S1
2.2	Calculate integrals over infinite intervals	S1
2.3	Apply the definite integral in geometry and engineering	S2
3	**Values: by the end of this course, the student is expected to be able to**	
3.1	Show the ability to work independently and within groups.	V2
3.2		
3.3		
3.4		

C. Course Content

No	List of Topics	Contact Hours
1	Implicit Differentiation and Related Rates	4
2	Differentials and Approximations	2
3	Inverse Functions and their Derivatives	4
4	Applications of the derivative	10
5	The Definite Integral	10
6	Applications of the Integral	10
	Total	40

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 and Understanding**		
1.1	List formulas and theorems of differentiation of some real valued functions.	Lecture and Tutorials	Exams, quizes

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Recall the relation between the derivative of a function and the derivative of its inverse	Lecture and Tutorials	Exams, quizes
1.3	Defined the principles of integral evaluation	Lecture and Tutorials	Exams, quizes
1.4		Lecture and Tutorials	Exams, quizes
2.0	**Skills**		
2.1	Calculate the derivative of various type of functions using some techniques of differentiation.	Lecture/Individual or group work	Exams, quizes
2.2	Calculate integrals over infinite intervals	Lecture/Individual or group work	Exams, quizes
2.3	Apply the definite integral in geometry and engineering	Lecture/Individual or group work	Exams, quizes
3.0	**Values**		
3.1	Show the ability to work independently and within groups.	Lecture/Individual or group work	Exams, quizes
3.2			
3.3			
3.4			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm exam	Sixth week	30%
2	Quizes and homeworks	During semester	20%
3	Final exam	End of semester	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 :

All faculty members are required to be in their offices outside teaching hours. Each member allocates at least 4 hours per week to give academic advice to students and to better explain the concepts seen during the lectures.

Students are required to complete the homework problems. Students are welcome to work together on homework. However, each student must turn in his or her own assignments, and no copying from another student's work is permitted. Deadline extensions for homework will not be given. Students are encouraged to discuss with professor about homework problems.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Calculus (9th Edition), Dale Varberg, Edwin Purcell and Steven Rigdon, Prentice Hall (2006).
Essential References Materials	• Thomas' Calculus (14^{th} Edition), George B. Thomas • Precalculus: Mathematics for Calculus (6^{th} Edition), James Stewart

Electronic Materials	None
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data Show, Smart Board
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Direct
Quality of learning resources	Students	Direct
Extent of achievement of course learning outcomes	Faculty Member	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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
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2020

Course Specifications

Course Title:	English Language 2
Course Code:	7001-3-102-4
Program:	Bachelor in Non-EMI Colleges (College of Applied Sciences, College of Islamic Economics and Finance, Department of Islamic Architecture
Department:	English Language Centre
College:	English Language Centre
Institution:	Umm Al Qura University

Table of Contents

A. Course Identification

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

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	6 hours per week	60%
2	**Blended**	10 hours per week	100%
3	**E-learning**	4 hours per week	40%
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	(10 hours) X (10 weeks)
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	100 hours

B. Course Objectives and Learning Outcomes

1. Course Description

English Language 2 (7001-3-102-4) is a single-level, English for General Purposes (EGP) course. All students who are admitted to Bachelor in the Non-EMI Colleges (College of Applied Sciences, College of Islamic Economics and Finance, Department of Islamic Architecture) are required to take this course in the second semester of the first year of their program. The course is offered in 10 weeks with a 10-hour-per week teaching plan covering the four language skills. It intends to develop students' knowledge and ability of English language in all major skills which include reading, writing, listening, and speaking, as well as in sub-skills including grammar, vocabulary, and pronunciation.

2. Course Main Objective

English Language 2 is one level taking students from (CEFR) A2 to B1

3. Course Learning Outcomes

CLOs	
1.0	**Knowledge**
1.1	**By the end of the course, the students are expected to be able to:** exhibit adequate comprehension of simple and complex spoken materials at the B1 level through recognizing key words, stress, intonation, pauses, and linkers in fast speech. - understand the main ideas of conversations, presentations, radio programmes, news reports, podcasts, discussions and interviews - identify main ideas and supporting ideas - develop listening for detail, examples and reasons - listen and read for opinions, attitude, and identify fact from opinion - identify rhetorical questions in a presentation
1.2	demonstrate an understanding of grammar at the B1 level, incorporating tenses, part of speech, modal auxiliaries, and sentence structure. - use indirect questions *"Can you tell me where …? I'd like to know what…"* - expand knowledge of present perfect to include how long something has occurred, and whether something has been done or not - use modals for giving advice *"I would…/ you should/ could…"* - be aware of the use of articles (a, an, the), and when no article is used - be aware of the difference in use of present continuous, going to and will for the future - use *-ed* and *-ing* adjectives correctly to describe feelings or opinions - use the past simple and past continuous correctly in narrative - be aware of the use of quantifiers, such as *a little, a lot of, so much, so many* - use conditionals for present and future real conditions
1.3	recognize and use lexical items such as words, collocations, and derivatives, both in general and academic contexts at the B1 level. - develop vocabulary of the topics covered in order to be able to talk about them with others - develop a bank of vocabulary for functional use, such as for describing the condition of possessions, for making decisions and plans, losing and finding things - use linking words for contrast, such as *although, but, however, on the other hand*. Be aware of their position in sentences - use linking words to organize text, *such as to start, after that, then, next finally* - use a range of vocabulary for describing graphs - provide definitions of difficult vocabulary in presentations, using expressions such as '*what I mean is…' 'that's when…'*
2.0	**Skills**
2.1 2.1.1	**Cognitive Skills:** demonstrate comprehension of simple and complex written texts at the B1 level through applying the skills of scanning, skimming, guessing from context and through recognizing linking words. - use scanning (to find information quickly) and skimming skills (to predict the meaning of the text from visuals, titles or common words) - identify the author or speaker's audience and purpose - read for opinions, attitude, and identify fact from opinion - understand meaning from context in both written and spoken texts
2.1.2	compose coherent/cohesive texts at the B1 level for various general and academic purposes through applying the skills of brainstorming ideas, composing an outline, and editing/revision. - write short texts, such as a travel post, an ad to request something, etc - write an email, brief life story or short story of more than one paragraph - write short texts expressing a point of view, feelings or opinion - write a description of a trend (describing statistics), using notes - write complex sentences

2.1.3	communicate effectively in spoken language at the B1 level in tasks such as oral presentations, group discussion, expressing opinions, and short talks. - discuss familiar and unfamiliar topics - reach a common consensus, eg who should be class leader - give short presentations - rank items in order of importance
2.2	**Critical Thinking** - develop well-reasoned, persuasive arguments - analyze sources of information when conducting research - evaluate things from a different perspective, eg what makes other people happy - evaluate and rank items according to usefulness or importance - evaluate arguments (evidence of support or relevance) - analyze advantages and disadvantages - infer meaning from written or spoken text - identify a specific audience and consider their need - appraise a text according to criteria, and provide feedback - identify inconsistencies and errors - appraise arguments - understand the links between ideas - organize ideas in a logical, systematic way - evaluate problems and propose solutions
2.3	**Communication, Information Technology, Numerical** - research, discuss and present information - describe and give personal opinions on a variety of topics - express general beliefs - paraphrase where needed - give recommendations - present persuasively
2.4	**Psychomotor** - give confident, persuasive presentations - take part in a role play - use intonation to show mood: express agreement, surprise, etc - use stress to highlight important information - use linking and weak forms in sentences
3.0	**Values**
3.1	develop life-long learning strategies so that students can take full responsibility of their English language skill development.
3.2	develop academic integrity.
3.3	collaborate in knowledge building and co-operate with peers: - hold short discussions with a partner to activate knowledge before listening tasks - hold short discussions with a partner to synthesize knowledge post-listening - work with others to brainstorm, create a convincing argument - give feedback to peers on writing, presentations, etc. - ask for opinions and check information
3.4	take the responsibilities to meet the requirements of the jobs market: - write a personal statement - explain changes and trends from data - use an appropriate opening and closing for a formal email

C. Course Content

No	List of Topics	Contact Hours
	Evolve: Level 3 (B1) Special Edition	
1	Unit 1: Who We Are Personality, getting to know someone, spending money, Qualities of a leader Video: What's the right job for you?	
2	Unit 2: So Much Stuff Personal possessions, describing things, switching topics, collecting things, the story of a person or place, essential items to take Video: Collections, old and new	
3	Unit 3: Smart Moves Describing a city, getting around, asking for and giving directions, a written personal statement, describing changes and trends, a 'secret spot' Video: One day in…	
4	Unit 4: Think First Opinions and reactions ("*it's interesting*"/ "*I'm interested*"), planning a trip, reassurance, describing plans, travel posts, microadventure Video: Making plans	
5	Unit 5: And then ... Lost and found, needing and giving help, surprises, storytelling, selfies, 'Believe it or not' Video: Lost and found	
6	Unit 6: Impact Big-city problems, problems and solutions, concern and relief, a podcast point of view, Big-city life, 'green' city planning Video: Green in the city	
Total		

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	**By the end of the course, the students are expected to be able to:** exhibit adequate comprehension of simple and complex spoken materials at the B1 level through recognizing key words, stress, intonation, pauses, and linkers in fast speech. - understand the main ideas of conversations, presentations, radio programmes, news reports, podcasts, discussions and interviews - identify main ideas and supporting ideas - develop listening for detail, examples and reasons - listen and read for opinions, attitude, and identify fact from opinion - identify rhetorical questions in a presentation	Listening exercises	Listening mid-term exam Listening final exam
1.2	demonstrate an understanding of grammar at the B1 level, incorporating tenses, part of speech, modal auxiliaries, and sentence structure. - use indirect questions *"Can you tell me where …? I'd like to know what…"* - expand knowledge of present perfect to include how long something has occurred, and whether something has been done or not - use modals for giving advice *"I would…/ you should/could…"* - be aware of the use of articles (a, an, the), and when no article is used - be aware of the difference in use of present continuous, going to and will for the future - use *-ed* and *-ing* adjectives correctly to describe feelings or opinions - use the past simple and past continuous correctly in narrative - be aware of the use of quantifiers, such as *a little, a lot of, so much, so many* - use conditionals for present and future real conditions	Grammar exercises	Midterm Exam Continuous writing assessment Continuous speaking assessment Quizzes Writing Final Exam Final Exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.3	recognize and use lexical items such as words, collocations, and derivatives, both in general and academic contexts at the B1 level. - develop vocabulary of the topics covered in order to be able to talk about them with others - develop a bank of vocabulary for functional use, such as for describing the condition of possessions, for making decisions and plans, losing and finding things - use linking words for contrast, such as *although, but, however, on the other hand*. Be aware of their position in sentences - use linking words to organize text, *such as to start, after that, then, next finally* - use a range of vocabulary for describing graphs - provide definitions of difficult vocabulary in presentations, using expressions such as *'what I mean is…' 'that's when…'*	Writing, reading, and vocabulary exercises	Midterm Exam Continuous writing assessment Continuous speaking assessment Quizzes Writing Final Exam Final Exam
2.0	**Skills**		
2.1 2.1.1	**Cognitive Skills:** demonstrate comprehension of simple and complex written texts at the B1 level through applying the skills of scanning, skimming, guessing from context and through recognizing linking words. - use scanning (to find information quickly) and skimming skills (to predict the meaning of the text from visuals, titles or common words) - identify the author or speaker's audience and purpose - read for opinions, attitude, and identify fact from opinion - understand meaning from context in both written and spoken texts	Reading comprehension exercises	Classroom discussion Midterm exam Final exam
2.1.2	compose coherent/cohesive texts at the B1 level for various general and academic purposes through applying the skills of brainstorming ideas, composing an outline, and editing/revision. - write short texts, such as a travel post, an ad to request something, etc - write an email, brief life story or short story of more than one paragraph - write short texts expressing a point of view, feelings or opinion - write a description of a trend (describing statistics), using notes - write complex sentences	Writing exercises	Continuous writing assessment Writing Final Exam

2.1.3	communicate effectively in spoken language at the B1 level in tasks such as oral presentations, group discussion, expressing opinions, and short talks. - discuss familiar and unfamiliar topics - reach a common consensus, eg who should be class leader - give short presentations - rank items in order of importance	Speaking exercises Discussion Presentation, eg an advertisement, a tourist campaign, a YouTube video	Continuous speaking assessment
2.2	**Critical Thinking** - develop well-reasoned, persuasive arguments - analyze sources of information when conducting research - evaluate things from a different perspective, e.g. what makes other people happy - evaluate and rank items according to usefulness or importance - evaluate arguments (evidence of support or relevance) - analyze advantages and disadvantages - infer meaning from written or spoken text - identify a specific audience and consider their need - appraise a text according to criteria, and provide feedback - identify inconsistencies and errors - appraise arguments - understand the links between ideas - organize ideas in a logical, systematic way - evaluate problems and propose solutions	Discussion Q & A	
2.3	**Communication, Information Technology, Numerical** - research, discuss and present information - describe and give personal opinions on a variety of topics - express general beliefs - paraphrase where needed - give recommendations - present persuasively	Demonstrations Active self-learning Pair work Group work e-learning Online material (Encourage students to make their presentations to small groups in the class)	Monitoring students' progress Evaluating the individual contribution Evaluating the teamwork Evaluating the final product (Evaluation of presentations may be by peers)
2.4	**Psychomotor** - give confident, persuasive presentations - use intonation to show mood: express agreement, surprise, etc. - stress new information - use linking and weak forms in sentences	Active self-learning Pair work Group work	Monitoring students' progress

3.0	Values		
3.1	develop life-long learning strategies so that students can take full responsibility of their English language skill development.	Cambridge application Cambridge LMS	Built-in immediate feedback
3.2	develop academic integrity.	Writing exercises	Continuous writing assessment Continuous speaking assessment Writing Final Exam
3.3	collaborate in knowledge building and co-operate with peers: - hold short discussions with a partner to activate knowledge before listening tasks - hold short discussions with a partner to synthesize knowledge post-listening - work with others to brainstorm, create a convincing argument - give feedback to peers on writing, presentations, etc - ask for opinions and check information	Peer work Group work	Evaluating the individual contribution Evaluating the teamwork Evaluating the final product
3.4	take the responsibilities to meet the requirements of the jobs market: - write a personal statement - explain changes and trends from data - use an appropriate opening and closing for a formal email	Individual, peer and group work inside classrooms. Extramural language work to master the competencies at this language level.	Monitoring students' progress

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam	The 5th	30
2	Listening Mid-term Exam	The 6th	5
3	Online Practice	from the 1st to the 10th	5
4	Continuous speaking assessment	from the 1st to the 10th	5
5	2 Quizzes (average)	4th / 9th	5
6	Listening Final Exam	from the 1st to the 10th	5
7	Final Exam	The 10th	45
	Total	The 11th	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:

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Hendra, L., Ibbotson, M., O'Dell, K., Tilbury, A. (2019). Evolve 3: Special Edition. Student's Book with Practice Extra. Cambridge University Press. UK: Cambridge University Press.
Essential References Materials	Multimedia
Electronic Materials	Cambridge LMS
Other Learning Materials	

2. Facilities Required

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

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources.	Faculty members	Direct: Course reports
Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources.	University students	Direct: Evaluation surveys

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	Curriculum and Accreditation Committees
Reference No.	
Date	Dec 30.2021

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	**General Physics 3**
Course Code:	**PHY1003-4**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours: 4 (3+1)	
2. Course type	
a. University ☐ College ☐ Department ☑ √ Others ☐	
b. Required ☑ √ Elective ☐	
3. Level/year at which this course is offered: Level 3rd / 1st year	
4. Pre-requisites for this course (if any)**: General Physics 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	60	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of general physics, such as, oscillations, wave mechanics, temperature, and heat and first law of thermodynamics, kinetic theory of gas, and image.

2. Course Main Objective

After completing this course student should be able to:

1. Describe the oscillation and wave motion.
2. Define the concepts of oscillations
3. Differentiate between the motion in one dimension and circular motion and vibration.
4. Define the concepts of the wave motions.

5. Define the concepts the temperature, Heat, and first law of thermodynamics, kinetic theory of gas.
6. Define the concepts of image.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the physical quantities related to the course.	K1
1.2	Describe the concepts and physical laws related to the course using the mathematical formula.	K2
1.3		
2	**Skills:**	
2.1	Apply physics laws to calculate physical quantities related to the course.	S1
2.2	Explain the procedures for scientific theoretical treatments as well as empirical observations.	S2
2.3		
3	**Values:**	
3.1	Work effectively responsibly in teamwork	V2
3.2		

C. Course Content

No	List of Topics	Contact Hours
1	**Oscillations** ● Simple Harmonic Motion ● The Force Law for Simple Harmonic Motion ● Energy in Simple Harmonic Motion ● An Angular Simple Harmonic Oscillator ● Pendulums ● Simple Harmonic Motion and Uniform Circular Motion ● Damped Simple Harmonic Motion ● Forced Oscillations and Resonance	**5**
2	**Waves-I** ● Types of Waves ● Transverse and Longitudinal Waves ● Wavelength and Frequency ● The Speed of a Traveling Wave ● Wave Speed on a Stretched String ● Energy and Power of a Wave Traveling Along a String ● The Wave Equation ● The Principle of Superposition for Waves ● Interference of Waves ● Phasors ● Standing Waves ● Standing Waves and Resonance	**5**
3	**Waves-II** ● Sound Waves ● The Speed of Sound ● Traveling Sound Waves ● Interference	**5**

	• Intensity and Sound Level • Sources of Musical Sound • Beats • The Doppler Effect Supersonic Speeds, Shock Waves	
4	**Temperature, Heat, and First Law of Thermodynamics** • Temperature • The Zeroth Law of Thermodynamics • Measuring Temperature • The Celsius and Fahrenheit Scales • Thermal Expansion • Temperature and Heat • The Absorption of Heat by Solids and Liquids • A Closer Look at Heat and Work • The First Law of Thermodynamics • Some Special Cases of First Law of Thermodynamics • Heat Transfer Mechanisms • Systems with Varying Mass: a Rocket	**5**
5	**The Kinetic Theory of Gases** • Avogadro's Number • Ideal Gases • Pressure, Temperature, and *rms* Speed • Translational Kinetic Energy • Mean Free Path • The Distribution of Molecular Speeds • The Molar Specific Heats of an Ideal Gas • Degrees of Freedom and Molar Specific Heats • The Adiabatic Expansion of an Ideal Gas	**5**
6	**Images** • Two Types of Image • Plane Mirrors • Spherical Mirrors • Images from Spherical Mirrors • Spherical Refracting Surfaces • Thin Lenses • Optical Instruments	**5**
	Practical Part: • Students will conduct various experiments in the practical part of the course. Each student will perform the experiment, collect data, extract result, and prepare a written report every week.	**10**
Total		40

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 and Understanding**		
1.1	Define the physical quantities related to the course.		1. Solve some examples during the lecture.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Describe the concepts and physical laws related to the course using the mathematical formula.	1. Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams. 3. Lecturing method: ● Board, Power point. ● Discussions ● Brain storming ● Start each chapter by general idea and the benefit of it.	2. Discussions during the lectures 3. Exams: a) Quizzes. b) Midterm exams. c) Final exam.
1.3			
2.0	**Skills**		
2.1	Apply physics laws to calculate physical quantities related to the course.	1. Solve some problems in physics during lectures. 2. Following some proofs during lectures. 3. Encourage students to participate in solving problems.	1. Solve some examples during the lecture. 2. Discussions during the lectures 3. Exams: a) Quizzes. b) Midterm exams. c) Final exam
2.2	Explain the procedures for scientific theoretical treatments as well as empirical observations.		
2.3			
3.0	**Values**		
3.1	Work effectively responsibly in teamwork	● Give students tasks of duties. ● Organize the students as a small group in the lab.	● Evaluate the scientific reports. ● Discussing the reports with each teamwork. ● Evaluate the efforts of each student in preparing the report.
3.2			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam	7^{th}	20 %
2	HomeWorks & Quizzes	All weeks	10 %
3	Practical Exam	End of the semester	20 %
4	Final Exam	End of the semester	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 be supervised by academic adviser in Physics Department and the time table for academic advice were given to the student each semester. (4 hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Halliday & Resnick, Jearl Walker, “Fundamentals of Physics” 10th Edition (2018)
Essential References Materials	Physics for Scientists & Engineers with Modern Physics 4th Edition by Douglas Giancoli, 4th Edition (2014).
Electronic Materials	1. Physics is Beautiful | Free, interactive physics lessons 2. Khan Academy Physics | Physics videos 3. The Feynman Lectures on Physics 4. PhET Simulations | Online physics simulations
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classroom • Library
Technology Resources (AV, data show, Smart Board, software, etc.)	• Data show • Black Bord
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	Questionnaire
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	
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T4 2020

Course Specifications

Course Title:	General Biology
Course Code:	
Program:	Faculty of Applied Science Requirement
Department:	Biology Department
College:	Applied Science
Institution:	Umm Al-Qura University

Table of Contents

A. Course Identification

1. Credit hours: 4 Credits	
2. Course type **a.** University ☐ College ☑ √ Department ☐ Others ☐ **b.** Required √ Elective ☐	
3. Level/year at which this course is offered: 1^{st} Year / 1^{st} Level	
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**	60hrs	100%
2	**Blended**	-	-
3	**E-learning**	-	-
4	**Distance learning**	-	-
5	**Other**	-	-

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30hrs
2	**Laboratory/Studio**	30hrs
3	**Tutorial**	-
4	**Others** (specify)/ Office hours	40hrs
	Total	100 hrs

B. Course Objectives and Learning Outcomes

1. Course Description

General Biology provides an overview of life on Earth, the evolutionary relationships among major groups of organisms, and the structural and functional characteristics of these organisms. The course covers major areas of biology ranging from cellular to whole organism and includes the study of ecosystems. The focus on cellular level processes leads to an understanding of the importance and roles of the cell. By comparing the processes in unicellular organism and multicellular plants and animals, candidates investigate the increasing levels of life complexity. The key areas of biodiversity and interdependence are covered, along with the processes leading to evolution as well as food security and ethical issues. General Biology is intended primarily for students majoring in any of the biological sciences or life science-related fields (Chemistry, physics, and mathematics).

2. Course Main Objective
The main objective of this course is to give an overview of the many features that are common to living organisms and what is meant by "life" and "living organisms.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
K1	Understanding the basic biological principles through an integrated approach.	
K2	Investigating the cellular processes of living organisms with an emphasis on biological chemistry applications.	
K3	Identify the unifying themes and key concepts of different organisms.	
K4	Describe the anatomy, function, genetics and evolution of different types of organisms.	
K5	Demonstrate factual knowledge of contemporary natural science.	
2	**Skills :**	
S1	The student will apply contemporary scientific models to describe the natural world.	
S2	To understand and apply the scientific method.	
S3	Demonstrate basic problem-solving processes, including observation, inference, measurement, prediction, use of numbers, classifying and use of space and time relationships in life sciences	
S4	Demonstrate integrated process skills, including identification and control of variables, interpretation of data, formulation and testing of hypotheses, and experimentation in the life sciences.	
3	**Values:**	
V1	An awareness of ethical, social and cultural issues within a global context and their importance in the exercise of professional skills and responsibilities.	
V2	A commitment to continuous learning and the capacity to maintain intellectual curiosity throughout life.	

C. Course Content

No	List of Topics	Contact Hours
1	**The Chemistry of Life** • The Chemical Context of Life • Water and Life • Carbon and the Molecular Diversity of Life • The Structure and Function of Large Biological Molecules	3
2	**The Cell** • A Tour of the Cell • Membrane Structure and Function • An Introduction to Metabolism • Cellular Respiration and Fermentation • Photosynthesis	3

	• Cell Communication • The Cell Cycle	
3	**Genetics** • Meiosis and Sexual Life Cycles • Mendel and the Gene Idea • The Chromosomal Basis of Inheritance • The Molecular Basis of Inheritance • Gene Expression: From Gene to Protein • Regulation of Gene Expression • Viruses • DNA Tools and Biotechnology	4
	Mechanisms of Evolution • Descent with Modification: A Darwinian View of Life • The Evolution of Populations • The Origin of Species • The History of Life on Earth	3
4	**The Evolutionary History of Biological Diversity** • Phylogeny and the Tree of Life • Bacteria and Archaea • Protists • Plant Diversity I: How Plants Colonized Land • Plant Diversity II: The Evolution of Seed Plants • Fungi • An Overview of Animal Diversity • An Introduction to Invertebrates • The Origin and Evolution of Vertebrates	4
5	**Plant Form and Function** • Vascular Plant Structure, Growth, and Development • Resource Acquisition and Transport in Vascular Plants • Soil and Plant Nutrition • Angiosperm Reproduction and Biotechnology • Plant Responses to Internal and External Signals	4
6	**Animal Form and Function** • Basic Principles of Animal Form and Function • Animal Nutrition • Circulation and Gas Exchange • The Immune System • Osmoregulation and Excretion • Hormones and the Endocrine System • Animal Reproduction • Animal Development • Neurons, Synapses, and Signaling • Nervous Systems • Sensory and Motor Mechanisms • Animal Behavior	5
7	**Ecology** • An Introduction to Ecology and the Biosphere • Population Ecology	4

	• Community Ecology • Ecosystems and Restoration Ecology • Conservation Biology and Global Change	
Total		**30**

No	Practical Topics	Contact Hours
1	Biology Lab Safety, Lab Notebook, Basic Biology Laboratory Equipment	3
2	Scientific Investigation Laboratory • Questions and Hypotheses Exercise • Designing Experiments to Test Hypotheses Exercise • Designing an Experiment Exercise • Presenting and Analyzing Results Exercise • Interpreting and Communicating Results	3
3	Microscopes and Cells Laboratory • The Compound Light Microscope Exercise • Basic Microscope Techniques Exercise • The Stereoscopic Microscope Exercise • The Organization of Cells	3
4	Diffusion and Osmosis Laboratory • Diffusion of Molecules Exercise • Osmotic Activity in Cells Exercise • Investigating Osmolarity of Plant Cells	3
5	Cellular Respiration and Fermentation Laboratory • Alcoholic Fermentation Exercise • Cellular Respiration Exercise • Designing and Performing Your Open-Inquiry Investigation	3
6	Photosynthesis Laboratory • The Wavelengths of Light for Photosynthesis Exercise • Pigments in Photosynthesis Exercise • Separation and Identification of Plant Pigments by Paper Chromatography Exercise • Determining the Absorption Spectrum for Leaf Pigments	3
7	Mitosis and Meiosis Laboratory • Modeling the Cell Cycle and Mitosis in an Animal Cell Exercise • Observing Mitosis and Cytokinesis in Plant Cells Exercise • Observing Chromosomes, Mitosis, and Cytokinesis in Animal Cells Exercise • Modeling Meiosis Exercise	3

	• Meiosis in Sordaria fimicola: A Study of Crossing	
8	Bacteriology Laboratory • Investigating Characteristics of Bacteria Exercise • Ecological Succession of Bacteria in Milk Exercise • Bacteria in the Environment Exercise • Controlling the Growth of Bacteria	**3**
9	Animal Development Laboratory • Development in Echinoderms: Sea Urchin and Sea Star Exercise • Development in an Amphibian Exercise • Development in the Zebraflsh Exercise • Development in a Bird: The Chicken	**3**
10	Plant Growth Laboratory • Factors Influencing Seed Germination Exercise • Plant Growth Regulators: Auxin Exercise • Plant Growth Regulators: Gibberellins Exercise	**3**
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 and Understanding**		
K1	Understanding the basic biological principles through an integrated approach.	Lectures Lab work	Quiz. Final and mid-term exam. Assignments and activities
K2	Understanding the cellular processes of living organisms.	Lectures Lab work	Quiz. Final and mid-term exam. Assignments and activities
K3	Identify the unifying themes and key concepts of different organisms.	Lectures Lab work	Quiz. Final and mid-term exam. Assignments and activities
K4	Describe the anatomy, function, genetics and evolution of different types of organisms.	Lectures Lab work	Quiz. Final and mid-term exam. Assignments and activities

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
K5	Demonstrate factual knowledge of contemporary natural science.	Lectures Research activity. Web based study	Quiz. Final and mid-term exam. Assignments and activities
2.0	**Skills**		
S1	The student will apply contemporary scientific models to describe the natural world.	Lectures Lab work	Quiz. Final and mid-term exam. Assignments and activities
S2	To understand and apply the scientific method.	Lectures Lab work Research activity	Quiz. Final and mid-term exam. Assignments and activities
S3	Demonstrate basic problem-solving processes, including observation, inference, measurement, prediction, use of numbers, classifying and use of space and time relationships in life sciences	Lectures Lab work Research activity	Quiz. Final and mid-term exam. Assignments and activities
S4	Demonstrate integrated process skills, including identification and control of variables, interpretation of data, formulation and testing of hypotheses, and experimentation in the life sciences.	Lab work Research activity	Quiz. Final and mid-term exam. Assignments and activities
3.0	Values		
V1	An awareness of ethical, social and cultural issues within a global context and their importance in the exercise of professional skills and responsibilities.	Lectures Lab work Research activity	Quiz. Final and mid-term exam. Assignments and activities
V2	A commitment to continuous learning and the capacity to maintain intellectual curiosity throughout life.	Lectures Lab work Research activity	Quiz. Final and mid-term exam. Assignments and activities

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes, Assignats, Problem set, Projects		10%

#	Assessment task*	Week Due	Percentage of Total Assessment Score
2	Midterm Exam (Lecture)		20%
3	Midterm Exam (Lab)		10%
5	Final Exam (Lab)		20%
6	Final Exam (Lecture)		40%
8	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 : 4 office hours per week

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	**Campbell Biology**, 12th Edition, Author(s): Lisa A. Urry, Micheal L. Cain, Steven A. Wasserman, Peter V. Minorsky, Rebecca B. Orr, Neil A. Campbell, Publisher: Pearson, Year: 2020, ISBN: 9780135988046; 0135988047 **Investigating Biology Laboratory Manual**, Ninth Edition by Judith Giles Morgan, Emory University, and M. Eloise Brown Carter, Oxford College of Emory University 978-0-13447346-8/0-134-47346-9
Essential References Materials	
Electronic Materials	1. https://www.coursera.org/learn/Biology 2. https://www.edx.org
Other Learning Materials	1. Handouts and Lecture notes 2. Microsoft office package. 3. Multi- media associated with the textbook and the relevant websites.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	1. Lecture room suitable for 40 students. 2. Lecture room equipped with Data show. 3. Biology laboratory.
Technology Resources (AV, data show, Smart Board, software, etc.)	1. Computers or internet connection. 2. Active Board. 3. Data show is required in every room.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	Laboratory instruments & equipment: light microscope, Spectrophotometer, centrifuge, pH meters, flasks,

Item	Resources
	beakers, screw capped tubes, slides and tips and chemicals kits.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Observations and the assistance of colleagues.	Faculty	Indirect
Effectiveness of teaching and assessment	Program leader, curriculum committee; external reviewers	Direct
Extent of achievement of CLO's	Peer Reviewer	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	Biology Program Updating Committee
Reference No.	
Date	1443(2022)

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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2020

Course Specifications

Course Title:	Theoretical Methods in Physics (1)
Course Code:	**PHY1101-4**
Program:	**Physics**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

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: 3Level /1st year	
4. Pre-requisites for this course (if any)**: General Physics (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**	40	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	-
3	**Tutorial**	-
4	**Others** (specify) Exams/ Quizzes	-
	Total	40

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 becomes primary. This course will cover the basic mathematical tools used in physical science: Power Series, Linear Algebra, Partial Differentiation, Vector Analysis. All topics in these series of courses are designed and presented in a way suitable for physics students specifically. Such courses rely fundamentally on applying all the mentioned mathematical tools in solving some complicated physics problems.

2. Course Main Objective

The course is designed to supply students for a variety of mathematical methods that are needed 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 and Understanding**	
1.1	Recognize the meaning of infinite series & its convergence.	K1(I)
1.2		K1(I)
1.3	Recognize the properties of various types of infinite series such as; Geometric Series, Alternating Series and Power Series.	K1(I), K2(I)
1.4		K1(I), K2(I)
1.5	Express some of the algebra operations between linear transformations	K1(I), K2(I)
	Explain matrix representation of a linear transformation.	
	Find concepts of eigenvalues and eigenvectors of a matrix.	
1.6	Evaluate partial derivatives, including higher order derivatives and simple cases of the chain rule, and recognize the various notations used for partial derivatives.	K1(I), K2(I)
1.7	Define vector fields (gradient, divergence, Curl)	K1(I)
	Express and prove Green's, Stokes's, and Divergence Theorems	
2	**Skills :**	
2.1	Apply mathematical operations on series, matrices and determinants to solve physics problems.	S1(I)
2.2		S1(I)
2.3	Demonstrate the rules of partial derivatives of a given function.	S1(I)
2.4		S1(I), S2(I)
2.5	Construct the gradient vector for multivariable functions	S1(I), S2(I)
	Explain geometrical and physical concepts of the directional derivatives,gradient, divergence, and Curl.	
2.6	Apply Green's, Divergence and Stokes' Theorems to simplify some complicated integrals in physics problems.	S2(I)
3	**Values:**	
3.1	Participate effectively in multidisciplinary and/or interdisciplinary teams.	V2(I)
3.2		V1(I), V2(I)
3.3		V1(I)
3.4		V1(I)

C. Course Content

No	**List of Topics**	**Contact Hours**
1	**Infinite series, Power series:** The Geometric Series, Convergent and Divergent Series, Testing Series for Convergence, Alternating Series, Conditionally Convergent Series, Useful Facts About Series, Power Series & Interval of Convergence, Theorems About Power Series, Expanding Functions in Power Series, Techniques for Obtaining Power Series Expansions, Accuracy of Series Approximations.	8
2	**Linear Algebra:**	8

	Matrices & Determinants, Cramer's Rule, Vectors, Lines and Planes, Matrix Operations, Linear Combinations, Linear Functions, Linear Operators, Special Matrices and Formulas, Linear Vector Spaces, Diagonalizing Matrices, Eigenvalues and Eigenvectors, Applications of Diagonalization.	
3	**Partial Differentiation:** Total differentials- Approximating using differentials, chain rule Implicit differentiation, Application to Maximum and Minimum problems, Lagrange Multipliers, Change of Variables, Differentiation of Integrals.	12
4	**Vector Analysis:** Triple (Scalar-Vector) products, Differentiation of Vectors, Scalar & vector Fields, Directional Derivative & Vector operators (Del, Gradient, Divergence, Curl, and Laplace's operators), Line Integrals, Multiple integration (surface and volume integrals), Green's Theorem in the Plane, The Divergence and the Divergence Theorem, The Curl and Stokes' Theorem.	12
	Total	**40**

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 and Understanding**		
1.1	Recognize what is meant by infinite series & its convergence.	1. Lectures. 2. Discussions 3. Slides and computer simulation software may be used by the teachers to clarify concepts. 4. Problems solving 5. Students may be asked to solve some problems on computer using	1- Homework assignments. 2- Group Project assignment. 3- Question – answer session in class. 4- Exams: quizzes, Mid-term, and final exams
1.2	Knowing convergence/divergence of some basis series.		
1.3	Identify various types of infinite series such as; Geometric Series, Alternating Series and Power Series.		
1.4	Expanding a given function in a power series and determine its interval of convergence.		
1.5	Identify the different types of matrices and differentiate between them and their determinants.		
1.6	Evaluate partial derivatives, including higher order derivatives and simple cases of the chain rule, and recognize the various notations used for partial derivatives.		
1.7	Be familiar with vector operators such as Del, Gradient, Divergence, Curl, etc.		
2.0	**Skills**		
2.1	Apply the appropriate test to determine whether a given infinite series is convergent or divergent.	1. Lectures. 2. Discussions. 3. Problems solving.	**1-** Homework assignments. **2-** Group Project assignment.
2.2	Be able to Diagonalize a given matrix and calculate their eigenvalues and eigenvectors.		

<table>
<tr><th>Code</th><th>Course Learning Outcomes</th><th>Teaching Strategies</th><th>Assessment Methods</th></tr>
<tr><td>2.3</td><td>Apply partial derivatives to find the maximum and minimum of a given function.</td><td rowspan="4">4. Encourage the student to look for the information in different references.
5. Ask the student to attend lectures for practice solving problem.
6. Define duties for each chapter</td><td rowspan="4">3- Question – answer session in class.
4- Exams: quizzes, Midterm, and final exams.</td></tr>
<tr><td>2.4</td><td>Calculate dot products and cross products and interpret them geometrically.</td></tr>
<tr><td>2.5</td><td>Construct the gradient vector for multivariable functions and determine the derivative in a given direction.</td></tr>
<tr><td>2.6</td><td>Apply Green’s, Divergence and Stokes’ Theorems to simplify some complicated integrals.</td></tr>
<tr><td>3.0</td><td colspan="3">Values</td></tr>
<tr><td>3.1</td><td>Participate effectively in multidisciplinary and/or interdisciplinary teams</td><td rowspan="4">1. Groupe assignments
2. Clarify deadlines for delivery of assignments, reports, and exams</td><td rowspan="4">1. Evaluate the efforts of each student in preparing the report.
2. Evaluate the work in teams. Evaluation of students’ presentations.</td></tr>
<tr><td>3.2</td><td>Accepting different ideas and respecting other opinions.</td></tr>
<tr><td>3.3</td><td>Manage a project (modelling or simulation) with due attention to time and resource management</td></tr>
<tr><td>3.4</td><td>Take responsibility and take the course instructions seriously.</td></tr>
</table>

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises and HomeWorks	All weeks	10%
2	Participation in activities and quizzes.	All weeks	10%
3	Midterm exam	6^{th} week	30%
4	Final exam	End of the 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:
4 Hours per week during office hours, in the instructor's office or by appointment.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Mary L. Boas, Mathematical methods in the Physical sciences, Third edition, John Wiley and Sons (2006). ISBN-13: 978-0471198260

Essential References Materials	**1.** Mathematical Methods for Physicists: A Comprehensive Guide 7th edition, by George B. Arfken, Hans J. Weber, Frank E. Harris, Academic Press is an imprint of Elsevier (2013), ISBN-13: 978-0-12-384654-9. **2.** Mathematical Methods for Physics and Engineering, by K. F. Riley, M. P. Hobson, and S. J. Bence, Cambridge University Press; (2006), ISBN-13: 978-0521679718.
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	**Resources**
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture room Labs
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)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	Students	Direct
Evaluation of Teaching	Department	Indirect
Improvement of Teaching	Program leaders	Direct
Quality of learning resources	Faculty	Direct
Extent of achievement of course learning outcomes	Program leaders	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	Dr Atif Ismail, Dr. Walid Belhadj and Prof. Khaled Abdel-Waged
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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2020

Course Specifications

Course Title:	English Language 3
Course Code:	7001-3-103-4
Program:	Bachelor in Non-EMI Colleges (College of Applied Sciences, College of Islamic Economics and Finance, Department of Islamic Architecture
Department:	English Language Centre
College:	English Language Centre
Institution:	Umm Al Qura University

Table of Contents

A. Course Identification

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

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	6 hours per week	60%
2	**Blended**	10 hours per week	100%
3	**E-learning**	4 hours per week	40%
4	**Distance learning**	0	0
5	**Other**	0	0

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	(10 hours) X (10 weeks)
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	100 hours

B. Course Objectives and Learning Outcomes

1. Course Description

English Language 3 (7001-3-103-4) is a single-level, English for General Purposes (EGP) course. All students who are admitted to Bachelor in the Non-EMI Colleges (College of Applied Sciences, College of Islamic Economics and Finance, Department of Islamic Architecture) are required to take this course in the third semester of the first year of their program. The course is offered in 10 weeks with a 10-hour-per week teaching plan covering the four language skills. It intends to develop students' knowledge and ability of English language in all major skills which include reading, writing, listening, and speaking, as well as in sub-skills including grammar, vocabulary, and pronunciation.

2. Course Main Objective

English Language 2 is one level taking students from (CEFR) A2 to B1

3. Course Learning Outcomes

CLOs	
1.0	**Knowledge**
1.1	**By the end of the course, the students are expected to be able to:** exhibit adequate comprehension of simple and complex spoken materials at the B1 level through recognizing key words, stress, intonation, pauses, and linkers in fast speech. - understand the main ideas of conversations, presentations, radio programmes, news reports, podcasts, discussions and interviews - identify main ideas and supporting ideas - develop listening for detail, examples and reasons - listen for opinions, attitude, and identify fact from opinion - recognize how discourse markers help identify main points, especially in academic discussions, presentations and lectures
1.2	demonstrate an understanding of grammar at the B1 level, incorporating tenses, part of speech, modal auxiliaries, and sentence structure. - use *used to* for past habits - use *as … as* for similarities and *not as … as* for comparisons - use present perfect continuous when describing recent activity - be aware of the difference in use of the present perfect simple and continuous - use modals for necessity, prohibition, permission and obligation - use present and past passive tenses to describe a product and where it comes from - use conditionals for present and future unreal conditions to talk about imaginary situations or to express wishes
1.3	recognize and use lexical items such as words, collocations, and derivatives, both in general and academic contexts at the B1 level. - develop vocabulary of the topics covered in order to be able to talk about them with others - develop a bank of vocabulary for functional use, such as for refusing invitations and responding to refusals, describing progress, expressing confidence or lack of it - use linking words for contrast, such as *although, but, however, on the other hand*. Be aware of their position in sentences and whether they are used in formal or informal texts - use *this* and *these* for referencing within a text - be aware of collocations, such as *significant advantage, key point,* and how they can help to follow and understand a talk - be aware of the different types of phrasal verb
2.0	**Skills**
2.1 2.1.1	**Cognitive Skills:** demonstrate comprehension of simple and complex written texts at the B1 level through applying the skills of scanning, skimming, guessing from context and through recognizing linking words. - use scanning (to find information quickly) and skimming skills (to predict the meaning of the text from visuals, titles or common words) - identify the author or speaker's audience and purpose - read for opinions, attitude, and identify fact from opinion - understand meaning from context in both written and spoken texts
2.1.2	compose coherent/cohesive texts at the B1 level for various general and academic purposes through applying the skills of brainstorming ideas, composing an outline, and editing/revision. - write short texts, such as an ad for a local product, an opinion on a podcast etc. - write an email, movie review or anecdote of more than one paragraph - write a short essay giving opinions with support in formal (academic) writing - write a description of a trend (describing statistics), using notes - write complex sentences - use a variety of linking words - use parallelism for bullet points in presentations and resumés

CLOs	
2.1.3	communicate effectively in spoken language at the B1 level in tasks such as oral presentations, group discussion, expressing opinions, and short talks. - discuss familiar and unfamiliar topics - reach a common consensus, e.g. when ranking profiles - discuss topics and react to the discussion - give short presentations, e.g. on a commercial for a product - show interest using short questions
2.2	**Critical Thinking** - develop well-reasoned, persuasive arguments - analyze sources of information when conducting research - evaluate things from a different perspective, eg what makes other people happy - evaluate and rank items according to usefulness or importance - evaluate arguments (evidence of support or relevance) - analyze advantages and disadvantages - infer meaning from written or spoken text - identify a specific audience and consider their need - appraise a text according to criteria, and provide feedback - identify inconsistencies and errors - evaluate the approach of others and reflect on personal assumptions, beliefs and values - understand the links between ideas - organize ideas in a logical, systematic way - evaluate problems and propose solutions - reflect on knowledge gained
2.3	**Communication, Information Technology, Numerical** - research, discuss and present information - describe and give personal opinions on a variety of topics - express general beliefs - paraphrase where needed - give recommendations - present persuasively
2.4	**Psychomotor** - give confident, persuasive presentations -take part in a role play -use intonation to show mood: express agreement, surprise, confidence, trepidation, etc -use contrastive stress -be aware of 'chunking' in speech -use linking and weak forms in sentences
3.0	**Values**
3.1	develop life-long learning strategies so that students can take full responsibility of their English language skill development.
3.2	develop academic integrity.
3.3	collaborate in knowledge building and co-operate with peers: - hold short discussions with a partner to activate knowledge before listening tasks -hold short discussions with a partner to synthesize knowledge post-listening -work with others to brainstorm, create a convincing argument -give feedback to peers on writing, presentations, etc. -ask for opinions and check information
3.4	take the responsibilities to meet the requirements of the jobs market: - write a resumé - be aware of the importance of good time management - give a presentation on your perfect job - discuss how to succeed - be aware of the importance of turn-taking in debates or discussions - be aware of learning from failure

C. Course Content

No	List of Topics	Contact Hours
Evolve: Level 3 (B1) Special Edition		
7	Unit 7: Entertain Us Reading, TV and movies, declining invites, a movie review, children and technology, changing tastes Video: The history of cinema	
8	Unit 8: Getting There Recent activity, describing progress, catching up, time management, hobbies, a better life Video: Serious hobbies	
9	Unit 9: Make It Work College subjects, studying or working from home (WFH), confidence – or lack of it, a resumé, bilingual education, a perfect job Video: The college life	
10	Unit 10: Why We Buy 'Green' clothing, product origins, a good choice? Product feedback, souvenirs, psychology of shopping Video:	
11	Unit 11: Pushing Yourself Success, unreal situations, giving and responding to opinions, your comfort zone, the psychology of fear, success stories Video: Tricks of the ad world	
12	Unit 12: Life's Little Lessons Accidents, extreme experiences, describing and asking about feelings, an anecdote, learning a skill Video: Testing your physical limits	
Total		

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	**By the end of the course, the students are expected to be able to:** exhibit adequate comprehension of simple and complex spoken materials at the B1 level through recognizing key words, stress, intonation, pauses, and linkers in fast speech. - understand the main ideas of conversations, presentations, radio programmes, news reports, podcasts, discussions and interviews - identify main ideas and supporting ideas - develop listening for detail, examples and reasons - listen for opinions, attitude, and identify fact from opinion - recognize how discourse markers help identify main points, especially in academic discussions, presentations and lectures	Listening exercises	Listening mid-term exam Listening final exam
1.2	demonstrate an understanding of grammar at the B1 level, incorporating tenses, part of speech, modal auxiliaries, and sentence structure. - use *used to* for past habits - use *as … as* for similarities and *not as … as* for comparisons - use present perfect continuous when describing recent activity - be aware of the difference in use of the present perfect simple and continuous - use modals for necessity, prohibition, permission and obligation - use present and past passive tenses to describe a product and where it comes from - use conditionals for present and future unreal conditions to talk about imaginary situations or to express wishes	Grammar exercises	Midterm Exam Continuous writing assessment Continuous speaking assessment Quizzes Writing Final Exam Final Exam
1.3	recognize and use lexical items such as words, collocations, and derivatives, both in general and academic contexts at the B1 level. - - develop vocabulary of the topics covered in order to be able to talk about them with others - develop a bank of vocabulary for functional use, such as for refusing invitations and responding to refusals, describing progress, expressing confidence or lack of it - use linking words for contrast, such as *although, but, however, on the other hand.* Be aware of their position in sentences and	Writing, reading, and vocabulary exercises	Midterm Exam Continuous writing assessment Continuous speaking assessment Quizzes Writing Final Exam Final Exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	whether they are used in formal or informal texts - use *this* and *these* for referencing within a text - be aware of collocations, such as *significant advantage, key point*, and how they can help to follow and understand a talk - be aware of the different types of phrasal verb		
2.0	**Skills**		
2.1 2.1.1	**Cognitive Skills:** demonstrate comprehension of simple and complex written texts at the B1 level through applying the skills of scanning, skimming, guessing from context and through recognizing linking words. - use scanning (to find information quickly) and skimming skills (to predict the meaning of the text from visuals, titles or common words) - identify the author or speaker's audience and purpose - read for opinions, attitude, and identify fact from opinion - understand meaning from context in both written and spoken texts	Reading comprehension exercises	Classroom discussion Midterm exam Final exam
2.1.2	compose coherent/cohesive texts at the B1 level for various general and academic purposes through applying the skills of brainstorming ideas, composing an outline, and editing/revision. - write short texts, such as an ad for a local product, an opinion on a podcast etc. - write an email, movie review or anecdote of more than one paragraph - write a short essay giving opinions with support in formal (academic) writing - write a description of a trend (describing statistics), using notes - write complex sentences - use a variety of linking words - use parallelism for bullet points in presentations and resumés	Writing exercises	Continuous writing assessment Writing Final Exam
2.1.3	communicate effectively in spoken language at the B1 level in tasks such as oral presentations, group discussion, expressing opinions, and short talks. - discuss familiar and unfamiliar topics - reach a common consensus, e.g. when ranking profiles - discuss topics and react to the discussion - give short presentations, e.g. on a commercial for a product - show interest using short questions	Speaking exercises Discussion Presentation, eg an advertisement, a tourist campaign, a YouTube video	Continuous speaking assessment

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.2	**Critical Thinking** develop well-reasoned, persuasive arguments - analyze sources of information when conducting research - evaluate things from a different perspective, eg what makes other people happy - evaluate and rank items according to usefulness or importance - evaluate arguments (evidence of support or relevance) - analyze advantages and disadvantages - infer meaning from written or spoken text - identify a specific audience and consider their need - appraise a text according to criteria, and provide feedback - identify inconsistencies and errors - evaluate the approach of others and reflect on personal assumptions, beliefs and values - understand the links between ideas - organize ideas in a logical, systematic way - evaluate problems and propose solutions - reflect on knowledge gained	Discussion Q & A	
2.3	**Communication, Information Technology, Numerical** - research, discuss and present information - describe and give personal opinions on a variety of topics - express general beliefs - paraphrase where needed - give recommendations - present persuasively	Demonstrations Active self-learning Pair work Group work e-learning Online material (Encourage students to make their presentations to small groups in the class)	Monitoring students' progress Evaluating the individual contribution Evaluating the teamwork Evaluating the final product (Evaluation of presentations may be by peers)
2.4	**Psychomotor** - give confident, persuasive presentations - take part in a role play - use intonation to show mood: express agreement, surprise, confidence, trepidation, etc - use contrastive stress - be aware of 'chunking' in speech - use linking and weak forms in sentences	Active self-learning Pair work Group work	Monitoring students' progress

3.0	Values		
3.1	develop life-long learning strategies so that students can take full responsibility of their English language skill development.	Cambridge application Cambridge LMS	Built-in immediate feedback
3.2	develop academic integrity.	Writing exercises	Continuous writing assessment Continuous speaking assessment Writing Final Exam
3.3	collaborate in knowledge building and co-operate with peers: -hold short discussions with a partner to activate knowledge before listening tasks -hold short discussions with a partner to synthesize knowledge post-listening -work with others to brainstorm, create a convincing argument -give feedback to peers on writing, presentations, etc. - ask for opinions and check information	Peer work Group work	Evaluating the individual contribution Evaluating the teamwork Evaluating the final product
3.4	take the responsibilities to meet the requirements of the jobs market: - write a resumé - be aware of the importance of good time management - give a presentation on your perfect job - discuss how to succeed - be aware of the importance of turn-taking in debates or discussions - be aware of learning from failure	Individual, peer and group work inside classrooms. Extramural language work to master the competencies at this language level.	Monitoring students' progress

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam	The 5th	30
2	Listening Mid-term Exam	The 6th	5
3	Online Practice	from the 1st to the 10th	5
4	Continuous speaking assessment	from the 1st to the 10th	5
5	2 Quizzes (average)	4th/ 9th	5
6	Listening Final Exam	from the 1st to the 10th	5
7	Final Exam	The 10th	45
	Total	The 11th	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:

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Hendra, L., Ibbotson, M., O'Dell, K., Tilbury, A. (2019). Evolve 3: Special Edition. Student's Book with Practice Extra. Cambridge University Press. UK: Cambridge University Press.
Essential References Materials	Multimedia
Electronic Materials	Cambridge LMS
Other Learning Materials	

2. Facilities Required

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

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources.	Faculty members	Direct: Course reports
Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources.	University students	Direct: Evaluation surveys

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	Curriculum and Accreditation Committees
Reference No.	
Date	Dec 30.2021

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Electricity and Magnetism 1**
Course Code:	**PHY2201-4**
Program:	**BSc**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

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: **Level 4/ 2^{nd} years**							
4. Pre-requisites for this course (if any)**:** General physics 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**	4	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40 Hours
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify) Exams & quizzes	
	Total	40 Hours

B. Course Objectives and Learning Outcomes

1. Course Description

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

2. Course Main Objective
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.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define fundamental concepts of electric charge, electric current, and electric field	K1-I
1.2	Extract electric potential from electric field, and vice versa	K1-I
1.3		K1-I
1.4	Investigate fundamentals of linear electric circuit components and how their operation is governed by the fundamental laws of electricity.	K2-I
2	**Skills :**	
2.1	Use physical laws and principles to calculate the electric field and the potential difference.	S1-P
2.2	analyze electric circuit	S1-P
2.3		S2-I
2.4		S2-P
2.5		S2-I
3	**Values:**	
3.1		V1-I
3.2	Collaborate with the others to resolve problems.	V2-I

C. Course Content

No	List of Topics	Contact Hours

1	**Coulomb's Law** Electric Charge, Conductors and Insulators, Coulomb's Law, Charge is quantized, Charge is conserved.	6
2	**Electric Fields** The Electric Field, Electric field lines, Electric Field Due to a Charged particle, Electric Dipole, The Electric Field Due to an Electric Dipole, Electric Field Due to a line of charge, The Electric Field Due to a Charged Disk, A Point Charge in an Electric Field, A Dipole in an Electric Field,	6
3	**Gauss' Law** Flux of an Electric Field, Gauss' Law, Gauss' Law and Coulomb's Law, A Charged Isolated Conductor, Applying Gauss' Law: Cylindrical Symmetry, Applying Gauss' Law: Planar Symmetry, Applying Gauss' Law: spherical Symmetry.	6
4	**Electric Potential** Electric Potential, Electric Potential Energy, Equipotential surfaces, Calculating the potential from the field, Potential Due to a Point Charge, Potential Due to a group of Point Charges, Potential Due to an Electric Dipole, Potential Due to a Continuous Charge Distribution, Calculating the field from the potential, Electric Potential Energy of a System of Point Charges, Potential of a Charged Isolated Conductor.	6
5	**Capacitance** Capacitors, Capacitance, Calculating the Capacitance, Capacitors in Parallel and in Series, Energy Stored in an Electric Field, Capacitor with a Dielectric. Dielectrics and Gauss' Law.	4
6	**Current and Resistance** Electric Currents, Current density, Resistance and Resistivity, Ohm's Law, Power in Electric Circuits. Semiconductors, Superconductors.	6
7	**Circuits** Single-Loop circuits, "Pumping" Charges, Work, Energy, and Emf, Calculating the Current in a Single-Loop Circuit, Other Single-Loop Circuits, Potential Difference Between Two Points, Multiloop Circuits (resistors in parallel and in series), The Ammeter and the Voltmeter, RC Circuits, Charging and Discharging a Capacitor. Sample problems.	6
Total		**40**

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 and Understanding**		
1.1	Recognize fundamental concepts of electric charge, electric current, and electric field.	1. Demonstrating the basic information and principles	1- Mid- term

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Extract electric potential from electric field, and vice versa	through lectures and the achieved applications 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: 4. Tutorials 5. Revisit concepts 6. Discussions 7. Start each chapter by general idea and the benefit of it; 8.Show the best ways to deal with problem; 9. Build a strategy to solve problem.	theoretical exam 2- Short quizzes. 3- Final theoretical exam
1.3	Explain how charges and currents respond to electric field and also how charges and current generate electric field.		
1.4	Investigate practical fundamentals of linear electric circuit components and how their operation is governed by the fundamental laws of electricity.		
2.0	**Skills**		
2.1	How to use physical laws and principles to calculate the electric field and the potential difference.	1. Preparing main outlines for teaching. 2. Following some proofs 3. Define duties for each chapter. 4. Homework assignments 5. Encourage the student to look for the information in different references.	1. Exams, short quizzes. 2. Asking about physical laws previously taught. 3. Discussions of how to simplify or analyze some phenomena.
2.2	How to simplify problems and analyze circuit		
2.3	Analyse and solve technical problems associated with capacitors of various symmetries,		
2.4	Calculate the net rate of energy transfer in a ideal and real batterys.		
2.5	Represent the physical problems mathematically.		
3.0	**Values**		
3.1	Relate theoretical scientific concepts to experimental results, Think in solving problems, Search on the internet,	· Active learning · Small group discussion	· Evaluate the work in team
3.2	Collaborate with the others to resolve problems.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quizzes	All weeks	10 %
3	Midterm's exam	8^{th} week	30 %
4	Final Exam (theoretical)	End of the 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 the time table for academic advice were given to the student each semester.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Fundamentals of Physics, by David Halliday, Robert Resnick, Jearl Walker, Wiley; 10th Edition, Extended Edition: 978-1-119-46013-8
Essential References Materials	
Electronic Materials	The website of the course.
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms and library.
Technology Resources (AV, data show, Smart Board, software, etc.)	
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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Introductory Modern Physics**
Course Code:	**PHY2311-4**
Program:	**Medical Physics**
Department:	**Physics**
College:	**Faculty of applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

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 years							
4. Pre-requisites for this course (if any)**:** General physics 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	70 Hours	100
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	40 Hours
2	Laboratory/Studio	30 Hours
3	Tutorial	
4	Others (specify)	
	Total	70 Hours

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of Modern physics, such as Relativity, Particle Properties of Waves, Wave Properties of Particles, Atomic Structure, Many-Electron Atoms and Molecules. This course will provide a conceptual and experimental background sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

1. Define the main properties of modern physics
2. Understand that all motion is relative
3. Explain how Energy and Momentum fit together in relativity
4. Understand that coupled electric and magnetic oscillations that move with the speed of light and exhibit typical wave behavior
5. Explain the origin of Blackbody Radiation by the quantum theory of light.
6. Understand How Energy and Momentum fit together in relativity
7. Show that the energies of electrons liberated by light depend on the frequency of the light
8. Write a general formula for waves
9. Explain that a photon is emitted when an electron jumps from one energy level to a lower level
10. Understand How atoms absorb and emit energy.
11. How an atom's electron structure determines its chemical behavior
12. Show that a molecule may have many different modes of vibration.
13. Explain how fluorescence and phosphorescence occur.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define relativity.	K1
1.2	Describe the particle properties of waves.	K2
1.3	Describe the wave properties of particles.	K2
1.4	Describe the atomic and molecule structures.	K2
2	**Skills:**	
2.1	Apply physical principles on physical phenomena.	S1
2.2	Derive the physical laws and formulas related to the laws of modern physics	S2
2.3	Analyse the quantitative results.	S3
3	**Values:**	
3.1	Show responsibility for self-learning to be aware of recent developments in modern physics.	V1
3.2	Work effectively in groups.	V2

C. Course Content

No	List of Topics	Contact Hours
1	**Chapter 1: Particle Properties of Waves** 1. Electromagnetic Waves 2. Blackbody Radiation 3. The photoelectric effect 4. What Is Light? 5. X-Rays 6. X-Ray Diffraction 7. Compton Effect 8. Pair Production 9. Photons and Gravity	8
2	**Chapter 2: Wave Properties of Particles**	8

	1. De Broglie waves, 2. Waves of What? 3. Describing a Wave 4. Phase and Group Velocities 5. Particle Diffraction 6. Particle in a Box 7. Uncertainty Principle I 8. Uncertainty Principle II 9. Applying for the Uncertainty Principle	
3	**Chapter 3: Atomic Structure** 1. The Nuclear Atom 2. Electron Orbits 3. Atomic Spectra 4. The Bohr Atom 5. Energy Levels and Spectra 6. Correspondence Principle 7. Nuclear Motion 8. Atomic Excitation 9. The Laser	8
4	**Chapter 4: Many-Electron Atoms** **1.** Electron Spin 2. Exclusion Principle 3. Symmetric and Antisymmetric Wave Functions 4. Periodic Table 5. Atomic Structures 6. Explaining the Periodic Table 7. Spin-Orbit Coupling 8. Total Angular Momentum **9.** X-Ray Spectra	8
5	**Chapter 5: Molecules** **1.** The Molecular Bond 2. Electronic Sharing 3. The H_2^+ Molecular Ion 4. The Hydrogen Molecule 5. Complex Molecules 6. Rotational Energy Levels 7. Vibrational Energy Levels 8. Electronic Spectra of Molecules	8
Total		40

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 and Understanding**		
1.1	Define relativity.	-Demonstrating the basic principles through lectures.	Solve some examples during the lecture.
1.2	Describe the particle properties of waves.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.3	Describe the wave properties of particles.	- Discussing phenomena with illustrating pictures and diagrams - Discussions	Exams: a) Quizzes (E-learning) b) Mid-term exams c) Final Exam d)Lab exam e) Homework.
1.4	Describe the atomic and Molecule structures.		
2.0	**Skills**		
2.1	Apply physical principles on physical phenomena.	- Preparing main outlines for teaching - Define duties for each chapter - Ask the student to attend lectures to practice solving problems	1. Midterm's exam. 2.Writing reports on selected parts of the course 4. Discussions on how to simplify or analyze some phenomena in solids.
2.2	Derive the physical laws and formulas related to the laws of modern physics		
2.3	Analyse the quantitative results.		
3.0	**Values**		
3.1	Show responsibility for self-learning to be aware of recent developments in modern physics.	• Enhance educational skills. • Develop their interest in modern physics. • Encourage the student to attend lectures regularly • Give students tasks of duties	• Evaluate the efforts of each student in preparing the report. • Evaluate the work in team
3.2	Work effectively in groups.		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	In-Class ,Participation ,Exercises Problem Solving	All weeks	10 %
2	Midterm exam	2nd-10th week	20 %
3	Lab exam	5th-6th week	20 %
4	Final exam	12th 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 be supervised by an academic adviser in the physics department and the timetable for academic advice was given to the student each semester.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Arthur Beiser, “Condepts of Modern Physics”, 6th Edition, McGraw-Hili Primls, (2003).

Essential References Materials	J. Bernstein, Paul Fishbane and Stephen Gasiorowicz, Modern Physics, 2-Hardback (2000).
Electronic Materials	The website of the course
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms and library
Technology Resources (AV, data show, Smart Board, software, etc.)	
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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of students	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standards of the exam papers

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	

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NCAAA
T4
2020

Course Specifications

Course Title:	**Theoretical Methods in Medical Physics**
Course Code:	**PHY2112-4**
Program:	**Medical Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

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: **4/2nd year**				
4. Pre-requisites for this course (if any)**:** Theoretical Methods in 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**	30	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	-
3	**Tutorial**	-
4	**Others** (specify) Exams/ Quizzes	-
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

The course is designed 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 and Understanding**	
1.1	State and clarify the course elements and their importance in other disciplines and research.	K1
1.2	Recognize and taste the physical meanings in the course elements and all related applications.	K2
1.3	Recall physics cases analogous to the discussed general cases.	K1,K2
1...		
2	**Skills :**	
2.1	Explain physical phenomena and concepts relevant to the course and their applications.	S1,S2
2.2	Justify the necessity of this course in other disciplines, and for higher level courses.	S2
2.3	Utilize critical thinking techniques to learn strategies, and how to use them appropriately and effectively.	S2
2...		
3	**Values:**	
3.1	Participate effectively in multidisciplinary and/or interdisciplinary teams	V1
3.2	Be able to self-learn in quantum physics-related topics	V2
3.3	Manage a project (modelling or simulation) with due attention to time and resource management	V1
3...		

C. Course Content

Contact Hours	List of Topics	No
9	**Fourier series and transforms** Periodic Functions Average Value of a Function Fourier Coefficients Complex Form of Fourier Series Even and Odd Functions Applications of Fourier Series, Fourier Transforms	1
12	**Ordinary differential equations:-** First order differential equations separable differential equations linear 1st order equations 2nd order differential equations Homogeneous differential equations Non-homogeneous differential equations	2
9	**Solution of Differential Equations by Laplace Transforms** The Laplace Transform Convolution The Dirac Delta Function A Brief Introduction to Green Functions	3
		...

30	Total

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 and Understanding**		
1.1	State and clarify the course elements and their importance in other disciplines and research.	Lecture	Written exam and Homework reports
1.2	Recognize and taste the physical meanings in the course elements and all related applications.	Lecture Discussion	Written exam
1.3	Recall applications of theoretical methods in physics 1 to be used appropriately in other disciplines and research areas.	Lecture and Group discussion	Written exam
2.0	**Skills**		
2.1	Explain physical phenomena and concepts relevant to the course and their applications.	Lectures	Written exam and Homework reports
2.2	Justify the necessity of this course in other disciplines and for graduate courses.	Groups discussion	Written exam; and summarizing research papers
2.3	Utilize critical thinking techniques to learn strategies, and how to use them appropriately and effectively.	Lectures and Group discussion	Homework reports and quizzes
3.0	**Values**		
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

Percentage of Total Assessment Score	Week Due	*Assessment task	#
20%	continuous	Assignments, Interaction during lectures, and others	**1**
30%	7	Midterm exam	**2**
50%	13	Final exam	**3**
			4
			5
			6
			7

***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 during office hours, in the instructor's office or by appointment.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Mary L. Boas, Mathematical methods in the Physical sciences, Third edition, John Wiley and Sons (2006). ISBN-13: 978-0471198260
Essential References Materials	G. Dennis Zill, R. Michael Cullen, Advanced engineering mathematics, third edition, Jones and Bartlett Publisher (2006), ISBN 9780763745912.
Electronic Materials	
Other Learning Materials	MATLAB

2. Facilities Required

Item	Resources
Accommodation Classrooms, laboratories, demonstration) (.rooms/labs, etc	Lecture room Labs
Technology Resources AV, data show, Smart Board, software,) (.etc	data show, software
Other Resources Specify, e.g. if specific laboratory) equipment is required, list requirements or (attach a list	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	Students	Direct
Evaluation of Teaching	Department	Indirect
Improvement of Teaching	Program leaders	Direct
Quality of learning resources	Faculty	Direct
Extent of achievement of course learning outcomes	Program leaders	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	Dr Atif Ismail, Dr. Walid Belhadj and Prof. Khaled Abdel-Waged
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	Introduction to medical physics
Course Code:	PHYM2301-5
Program:	physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 4 /2nd year	
4. Pre-requisites for this course (if any): General physic (3)	
5. Co-requisites for this course (if any): Medical physics lab.	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	40	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	30
3	**Tutorial**	
4	**Others** (specify)	
	Total	70

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

This course is designed to demonstrate the study of;

1- The motions of the living bodies as: static forces, friction, translational motion, angular motion,

2- Define elasticity and strength of materials.

3- Acquire basics of fluids, the motion of fluids and body fluid flow.

4- Discuss the fundamentals of heat and life, kinetic theory and thermodynamics.

5- Describe different types of waves, sound, electricity, electrical technology.

6-Identify forces on bones and muscles, electrodynamics of nerve impulses, electrocardiograms, magnetocardiograms and magnetoencephalograms. 7- List different diffusion processes, membrane transport, kidney function. 8-Describe different biological effects in magnetic resonance and ultra-low frequency electromagnetic radiation, radiation therapy, imaging. and laser applications.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	To recognize facts, principle and concepts of elementary medical Physics	K3
1.2	To understand the physical laws of human bod equilibrium	K2
1.3	Describe concepts, Procedures of some experiments in medical physics	K2
1...		
2	**Skills :**	
2.1	Apply the laws of medical physics.	S2
2.2	Solve problems in Physics by using suitable mathematical principles	S1
2.3	Analyse and interpret quantitative results	S3
2...	Express the medical physical phenomena mathematically.	S1
3	**Values:**	
3.1	Collect and classify the material for a course	V1
3.2	Use basic medical physics terminology in English	V2
3.3	Acquire the skills to use the internet communicates tools.	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	❖ **Heat and Life** 1 Energy Requirements of People 2 Energy from Food 3 Regulation of Body Temperature 4 Control of Skin Temperature 5 Convection 6 Radiation 7 Radiative Heating by the Sun 8 Evaporation 9 Resistance to Cold 10 Heat and Soil Exercises	8
2	❖ **Wavs and Sound** 1 Properties of Sound 2 Some Properties of Waves (Reflection, Refraction, Interference, Diffraction) 3 Hearing and the Ear (Performance, Frequency and Intensity and Loudness) 4 Bats and Echoes 5 Sounds Produced by Animals 6 Acoustic Traps 7 Clinical Uses of Sound	4

	8 Ultrasonic Waves Exercises	
3	❖ **Electricity** 1 The Nervous System 2 The Neuron 3 Electrical Potentials in the Axon 4 Action Potential 5 Propagation of the Action Potential 6 Synaptic Transmission 7 Action Potentials in Muscles .8 Surface Potentials 9 Electricity in the Bone	4
4	❖ **Electrical Technology** 1 Electrical Technology in Biological Research 2 Diagnostic Equipment 3 Physiological Effects of Electricity 4 Bioelectronic Medici 5 Control Systems 6 Feedback 7 Sensory Aids	4
5	❖ **Optics** 1 Vision. 2 Nature of Light 3 Structure of the Eye 4 Accommodation 5 Eye and the Camera 6 Lens System of the Eye 7 Reduced Eye .8 Retina 9 Resolving Power of the Eye. 10 Threshold of Vision 11 Vision and the Nervous System. 12 Defects in Vision. 13 Lens for Myopia. 14 Lens for Presbyopia and Hyperopia 15 Fiber Optics	8
6	❖ **Atomic Physics** 1 The Atom 2 Spectroscopy 3 Quantum Mechanics 4 Electron Microscope 5 X-rays 6 X-ray Computerized Tomography 7 Lasers & Lasers applications in medicine Exercises	4
7	❖ **Nuclear Physics** 1 The Nucleus 2 Magnetic Resonance Imaging 3 Radiation Therapy 4 Food Preservation by Radiation 5 Isotopic Tracers 6 Laws of Physics and Life Exercises	4
8	**Nanotechnology in Biology and Medicine** 1 Nanostructures	4

	2 Nanotechnology 3 Some Properties of Nanostructures 4 Medical Applications of Nanotechnology 5 Concerns Over Use of Nanoparticles in Consumer Products	
...		
Total		40

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 and Understanding**		
1.1	Recognize facts, principle and concepts of elementary medical Physics	1- Demonstrating the basic principles through lectures.	Recognize facts, principle and concepts of elementary medical Physics
1.2	Describe concepts, Procedures of some experiments in medical 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**		
2.1	Apply the laws of medical 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		
…	Analyse and interpret quantitative results		
	Express the medical physical phenomena mathematically.		
3.0	**Values**		
3.1	Communicate effectively in oral and written form	• Homework • Preparing a report on some topics related to the course depending on web sites.	• Evaluation of presentations • Evaluation of reports • Practical exam • Homework. Final exams.
3.2	Collect and classify the material for a course		
…	Use basic medical physics terminology in English		
	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 & Homework	All weeks	10 %
2	Midterm's exam	All weeks	20 %
3	Lab.	8th week	20 %

4	Final Exam (theoretical)	13^{th} 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-Paul Davidovits "Physics in Biology and Medicine" 5th edd. Elsevier 2019. ISBN 978-0-12-813716-1 2-Russell K. Hobbie & Bradley J. Roth "Intermediate Physics for Medicine and Biology" 5th edd. 2015 Springer Science ISBN 978-3-319-12681-4.
Essential References Materials	John R. Cameron & James G. Skofronick "Medical physics" Willy John 1988 Raymond A. Serway - John W. Jewett "Physics for Scientists and Engineers" 2004. Physics, 4^{th} edition, By: Halliday, Resnick, and Krane, Wiley (1992)
Electronic Materials	http://www.jmp.org.in/ Journal of Medical Physics http :// www.springer.com http:// www.sciencedirect.com http:// www.gigabedia .org
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Electricity and Magnetism 2**
Course Code:	**PHY2202-4**
Program:	**BSc**
Department:	**Physics**
College:	**Applied Sciences**
Institution:	**Umm Al-Qura University**

Table of Contents

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: **Level 5/ 2nd years**								
4. Pre-requisites for this course (if any)**:** Electricity and Magnetism 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**	60	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30 Hours
2	**Laboratory/Studio**	30 Hours
3	**Tutorial**	
4	**Others** (specify)	
	Total	60 Hours

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 following: Magnetic Fields, Magnetic Fields Due to Currents, Induction and Inductance, Maxwell's Equations; Magnetism of Matter and Electromagnetic Waves.

2. Course Main Objective

1- 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.
2- 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.
3- State Faraday's Law of Induction with Lenz's Law and use these equations to solve technical problems associated with induction.
4- Calculate inductance according to the fundamental definition, solve technical problems associated with LR circuits and coils, and calculate the stored energy in magnetic fields
5- Identify that the simplest magnetic structure is a magnetic dipole.
6- Identify that the net magnetic flux through a Gaussian surface (which is a closed surface) is zero.
7- List Maxwell's equations and the purpose of each.
8- Identify field declination and field inclination
9- Explain the classical loop model for an orbiting electron and the forces on such a loop in a nonuniform magnetic field.
10- Distinguish diamagnetism, paramagnetism, and ferromagnetism.
11- For a diamagnetic sample placed in an external magnetic field, identify that the field produces a magnetic dipole moment in the sample, and identify the relative orientations of that moment and the field.
12- For a diamagnetic sample in a nonuniform magnetic field, describe the force on the sample and the resulting motion.
13- For a paramagnetic sample placed in an external magnetic field, identify the relative orientations of the field and the sample's magnetic dipole moment.
14- For a paramagnetic sample at a given temperature and in a given magnetic field, compare the energy associated with the dipole orientations and the thermal motion.
15- Identify that ferromagnetism is due to a quantum mechanical interaction called exchange coupling.
16- Identify magnetic domains.
17- In the electromagnetic spectrum, identify the relative wavelengths (longer or shorter) of AM radio, FM radio, television, infrared light, visible light, ultraviolet light, x rays, and gamma rays.
18- Identify that electromagnetic waves do not require a medium and can travel through vacuum.

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 and Understanding**	
1.1	Recognize the fundamental concepts of magnetic field	K1-I
1.2		K2-P
1.3	Recognize the relationship between the electric field and the magnetic field	K2-P

CLOs		Aligned PLOs
1.4	Identify the magnitude of the magnetic field set up by a electric currents	K2-I
2	**Skills :**	
2.1	Define the magnetic field and magnetic flux	S1-I
2.2	Solve technical problems related to electric and magnetic fields.	S1-I
2.3		S2-I
2.4	List Maxwell's equations and the purpose of each.	S2-P
2.5		S2-I
3	**Values:**	
3.1		V1-I
3.2	Collaborate with the others to resolve problems.	V2-I

C. Course Content

No	List of Topics	Contact Hours
1	**Magnetic Fields** The source of a Magnetic Field The Definition of the Magnetic Field, Crossed Fields: Discovery of the Electron, Crossed Fields: The Hall Effect, A Circulating Charged Particle, Cyclotrons and Synchrotrons, Magnetic Force on a Current-Carrying Wire, Torque on a Current Loop, The Magnetic Dipole Moment.	6
2	**Magnetic Fields Due to Currents** Calculating the Magnetic Field Due to a Current, Magnetic Field Due to a Current in a Long Straight Wire, Magnetic Field Due to a Current in a Circular Arc of Wire, Force Between Two Parallel Currents, Ampere's Law, Magnetic Field Outside a Long Straight Wire with Current , Magnetic Field Inside a Long Straight Wire with Current , Solenoids and Toroids, A Current-Carrying Coil as a Magnetic Dipole.	6
3	**Induction and Inductance** Faraday's Law of Induction, Lenz's Law. Induction and Energy Transfers, Induced Electric Fields, Inductors and Inductance, Self-Induction, RL Circuits, Energy Stored in a Magnetic Field, Energy Density of a Magnetic Field, Mutual Induction,	6
4	**Maxwell's Equations; Magnetism of Matter** Gauss' Law for Magnetic Fields, Induced Magnetic Fields, Displacement Current, Maxwell's Equations, Magnets, Magnetism and Electrons, Magnetic Materials, Diamagnetism, Paramagnetism, Ferromagnetism,	6
5	**Electromagnetic Waves** Maxwell's Rainbow, The Traveling Electromagnetic Wave, Qualitatively, The Traveling Electromagnetic Wave, Quantitatively, Energy Transport and the	6

	Poynting Vector, Radiation Pressure, Polarization, Reflection and Refraction, Total Internal Reflection, Polarization by Reflection,	
6	**Practical Part:** Students will conduct various experiments in the practical part of the course. Each student will perform the experiment, collect data, extract result, and prepare a written report every week.	10
Total		**40**

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 and Understanding**		
1.1	Recognize most fundamental concepts of magnetic field	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. Power point b. e-learning 4. Tutorials 5. Revisit concepts 6. Discussions 7. Start each chapter by general idea and the benefit of it; 8. Build a strategy to solve problem	·Mid- term theoretical exam ·Final practical exam ·Final theoretical exam
1.2	Apply the sinusoidal equations for the electric and magnetic components of an EM wave, written as functions of position and time		
1.3	Apply the relationship between the electric field magnitude E, the magnetic field magnitude B, and the speed of light c.		
1.4	Identify the magnitude of the magnetic field set up by a current-length element at a point in line with the direction of that element.		
2.0	**Skills**		
2.1	Define the magnetic field and magnetic flux, solve technical problems associated with the effect of static, non-uniform and uniform magnetic fields.	1. Preparing main outlines for teaching 2. Following some proofs 3. Define duties for each chapter 4. Homework assignments 5. Encourage the student to look for the information in different references 6. 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. Discussions of how to simplify or analyze some phenomena.
2.2	Identify magnetic domains.		
2.3	Distinguish diamagnetism, paramagnetism, and ferromagnetism.		
2.4	List Maxwell's equations and the purpose of each.		
2.5	Explain that electromagnetic waves do not require a medium and can travel through vacuum.		
3.0	**Values**		
3.1	Write a report, Search on the internet, Collect the material of the course.	· Lab work	

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.2	Collaborate with the others to resolve problems.	· 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.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Midterm's exam (theoretical)	8^{th} week	20 %
3	Lab. exam	11^{th} week	20 %
4	Final Exam (theoretical)	End of the 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 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	Fundamentals of Physics, by David Halliday, Robert Resnick, Jearl Walker, Wiley; 10th Edition, Extended Edition: 978-1-119-46013-8

Essential References Materials	
Electronic Materials	The website of the course
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.)	
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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Course Specifications

Course Title:	Electromagnetism and Electromagnetic Waves
Course Code:	PHY2213-4
Program:	**Medical Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

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 7th / 3rd year							
4. Pre-requisites for this course (if any)**: Electricity and Magnetism (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**	40	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

This course deals primarily with a vector analysis-based description of static electric field, electric flux, and electric potential for a distribution of charges, and application of Gauss's law. Also, the course deals with a vector analysis-based description of magnetic field, magnetic flux, and magnetic potential, and application of Gauss's law as well as the magnetic induction for a steady current circuit. The course contains Maxwell's equations and their applications, electromagnetic waves, propagation of the electromagnetic wave in different media.

2. Course Main Objective

The student will be able to

- Use vector analysis for solving electrostatic problems and expression of electric fields, electric flux, and electric potential for charge distribution.
- Calculate the magnetic fields due to electric current using Biot-Savart law.

- 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.
- Calculate the self-inductance and mutual inductance.
- Apply Maxwell's equations for solving electromagnetic problems.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the physical quantities related to the static electricity, magnetism, Maxwell equations, and electromagnetic waves.	K1
1.2	Describe the concepts and laws related to the static electricity, magnetism, Maxwell equations, and electromagnetic waves using vector analysis.	K1
2	**Skills :**	
2.1	Solve problems related to the static electricity, magnetism, Maxwell equations, and electromagnetic waves using vector analysis.	S1
2.2	Explain the physical formulas related to the static electricity, magnetism, Maxwell equations, and electromagnetic waves.	S2
3	**Values:**	
3.1	Work effectively and responsibly in teamwork.	V2

C. Course Content

No	List of Topics	Contact Hours
1	**Review on Vector Analysis** • Vector formulas. • Vector operations. • The line integral. • The surface integral. • The divergence theorem. • Stokes' theorem. • Cartesian, spherical, and cylindrical Coordinates.	4
2	**Electrostatics** • Electric charge. • Coulomb's law. • The electric field. • Electrostatic potential. • Conductors & insulators. • Gauss's law. • The electric dipole.	8

3	**Electric Current** • Current density & equation of continuity. • Ohm's law. • Steady currents in continuous media. • **Microscopic theory of conduction.**	2
4	**The Magnetic Field of Steady Current** • Induction to magnetic field. • Lorentz force law and its applications. • Biot-Savart Law and its applications. • Ampere's Law. • Application of Ampere's law. • Divergence and curl of magnetic field. • The magnetic vector potential. • The magnetic scalar potential. • The Magnetic flux.	8
5	**The Electromagnetic Induction** • Self-inductance. • Mutual inductance.	2
6	**Maxwell's Equation's and Electromagnetic Waves** • The generalization of Ampere's law, Displacement Current. • Maxwell's equations. • The wave equation. • Plane monochromatic waves in nonconducting media. • Plane monochromatic waves in conducting media.	8
7	**Application of Maxwell's Equation's** • Boundary conditions. • Refraction and reflection at the boundary of two non-conducting media. Normal incidence. • Reflection and refraction at boundary between two conducting media. • The reflection at a conducting pane (Normal incidence).	8
Total		40

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 and Understanding**		
1.1	Define the physical quantities related to the static electricity, magnetism, Maxwell equations, and electromagnetic waves.	1. Demonstrating the basic principles through lectures. 2. Discussing phenomena with	- Solve some examples - Discussions during the lectures

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	Describe the concepts and laws related to the static electricity, magnetism, Maxwell equations, and electromagnetic waves using vector analysis.	illustrating pictures and diagrams. 3. Lecturing method: Board, Power point. 4. Discussions 5. Brain storming Start each chapter by general idea and the benefit of it.	Exams: a) Quizzes. b) Midterm exams. c) Final exam.
2.0	**Skills**		
2.1	Solve problems related to the static electricity, magnetism, Maxwell equations, and electromagnetic waves using vector analysis.	1. Preparing main outlines for teaching. 2. Following some proofs. 3. Define duties for each chapter	1. Exams: a) Quizzes. b) Midterm exams. c) Final exam 2. Homework's.
2.2	Explain the physical formulas related to the static electricity, magnetism, Maxwell equations, and electromagnetic waves.		
3.0	**Values**		
3.1	Work effectively and responsibly in teamwork.	• Organize the students in a small groups (teamwork). • Give students tasks of duties as a small project.	• Evaluate the scientific reports. • Discussing the reports with each teamwork. • Evaluate the efforts of each student in preparing the report.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Midterm Exam	8^{th}	30%
2	Homework's & Quizzes& Reports	All weeks	20 %
3	Final Exam	End of the semester	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 be supervised by academic adviser in Physics Department and the time table for academic advice were given to the student each semester. (4 hrs per week)

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Foundations of Electromagnetic Theory by John R. Reitz, and Frederick J. Milford (1960).
Essential References Materials	
Electronic Materials	
Other Learning Materials	• Introduction to Electrodynamics by David J. Griffiths, 4th edition. • Modern Electrodynamics by Andrew Zangwill, (2013). • Electromagnetic Fields by Roald K. Wangsness, 2nd edition.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	- Classroom
Technology Resources (AV, data show, Smart Board, software, etc.)	- Black Board - 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	Questionnaire
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	
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Fundamentals of Quantum Mechanics**
Course Code:	PHY2411-4
Program:	**Medical Physics**
Department:	**Physics**
College:	**Faculty of applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

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: 5/2nd year	
4. Pre-requisites for this course (if any)**: Introductory Modern Physics**	
5. Co-requisites for this course (if any)**:**	

6. Mode of Instruction (mark all that apply)

Percentage	Contact Hours	Mode of Instruction	No
%100	40	**Traditional classroom**	**1**
-	-	**Blended**	**2**
-	-	**E-learning**	**3**
-	-	**Distance learning**	**4**
-	-	**Other**	**5**

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	-
3	**Tutorial**	-
4	**Others** (specify) Exams/ Quizzes	-
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction to non-relativistic quantum mechanics. Postulates of quantum mechanics, wave functions, operator formalism and Dirac notation. Bound and unbound problems, including infinite square well, Harmonic oscillator. It also introduces Angular momentum operators, Hydrogen atoms, and Spin operators.

2. Course Main Objective

1: The student will be able to formulate and explain fundamental concepts of quantum mechanics.
2: The student will learn to solve Schrodinger's equation to obtain eigenvectors and energies.
3: The student will learn to calculate and describe the propagation of a particle in a simple, one-dimensional potential.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	State and clarify the course elements and their importance in other disciplines and research.	K1, K3
1.2	Recognize and taste the physical meanings in the course elements and all related applications.	K4, K3
1.3	Recall physics cases analogous to the discussed general cases.	K1, K2
1...		
2	**Skills:**	
2.1	Explain physical phenomena and concepts relevant to the course and their applications.	S1, S2
2.2	Justify the necessity of this course in other disciplines, and for higher level courses.	S2, S4
2.3	Utilize critical thinking techniques to learn strategies, and how to use them appropriately and effectively.	S2, S4
2...		
3	**Values:**	
3.1	Participate effectively in multidisciplinary and/or interdisciplinary teams	V1
3.2	Be able to self-learn in quantum physics-related topics	V2
3.3	Manage a project (modelling or simulation) with due attention to time and resource management	V3
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Postulates of Quantum Mechanics: Eigenvalue equation Commutator relations: Linear and Hermitian operators	4
2	The Wave function: Schrodinger Equation- Statistical interpretation- Probability	4
3	Normalization- Momentum- Uncertainty principle.	4
4	One Dimensional Time- Independent Schrodinger Equation: – Bound Systems: The Infinite Square well, The Harmonic Oscillator (Algebraic method) – Unbound state: Scattering and tunneling, Step potential	12
5	Three- Dimensional Time- Independent Schrodinger Equation: – Solution In Rectangular Coordinate – Angular Momentum – Solution in Spherical Coordinate – The Hydrogen Atoms	8
6	Dirac Notation	2
7	Spin Angular momentum – Spin Operators, Adding Angular momentum, The Matrix Representation of Spin, Spin Precession	6

Total	40

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 and Understanding**		
1.1	State and clarify the course elements and their importance in other disciplines and research.	Lecture	Written exam and Homework reports
1.2	Recognize and taste the physical meanings in the course elements and all related applications.	Lecture Discussion	Written exam
1.3	Recall applications of Schrödinger equation in Quantum Physics 1 to be used appropriately in other disciplines and research areas.	Lecture and Group discussion	Written exam
2.0	**Skills**		
2.1	Explain physical phenomena and concepts relevant to the course and their applications.	Lectures	Written exam and Homework reports
2.2	Justify the necessity of this course in other disciplines and for graduate courses.	Groups discussion	Written exam; and summarizing research papers
2.3	Utilize critical thinking techniques to learn strategies, and how to use them appropriately and effectively.	Lectures and Group discussion	Homework reports and quizzes
3.0	**Values**		
3.1	The ability to take responsibility and take the course instructions seriously	Groupe assignments Clarify deadlines for delivery of assign-ments, reports, and exams	Evaluate the efforts of each student in preparing the report. Evaluate the work in teams. Evaluation of stu-dents' presentations.
3.2	The ability to be an effective member of the working group		
3.3	Accept different nationalities and re-spect other opinions		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises and HomeWorks	All weeks	10%
2	Participation in activities	All weeks	10%
3	Mid-term exam	5^{th} week	30%
4	Final exam	12^{th} 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 during office hours, in the instructor's office or by appointment.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	David J. Griffiths , ‘Introduction to Quantum Mechanics’, Pearson Prentice Hall, USA, 2^{nd} edition (2017). ISBN-13: 978-1107189638
Essential References Materials	Stephen Gasiorowicz, ‘Quantum Mechanics’, John Wiley & Sons, Inc., 3rd Ed. (2003) ISBN: 978-0-471-05700-0
Electronic Materials	https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/lecture-videos/
Other Learning Materials	MATLAB

2. Facilities Required

Item	Resources
Accommodation Classrooms, laboratories, demonstration) (.rooms/labs, etc	Lecture room Labs
Technology Resources AV, data show, Smart Board, software,) (.etc	data show, software
Other Resources Specify, e.g. if specific laboratory) equipment is required, list requirements or (attach a list	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Student Feedback on Effectiveness of Teaching	Students	Direct
Evaluation of Teaching	Department	Indirect
Improvement of Teaching	Program leaders	Direct
Quality of learning resources	Faculty	Direct
Extent of achievement of course learning outcomes	Program leaders	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	Dr Atif Ismail, Dr. Walid Belhadj and Prof. Khaled Abdel-Waged
Reference No.	
Date	

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Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Introduction to Solid State Physics**
Course Code:	PHY2611-4
Program:	**BSc Medical Physics**
Department:	**Physics department**
College:	**Faculty of applied science**
Institution:	**Um Al Qura University**

Table of Contents

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 5/ 2nd year			
4. Pre-requisites for this course (if any)**:** Introductory modern physics			
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 hrs a week	100
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	3 hrs a week
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30 hrs

B. Course Objectives and Learning Outcomes

1. Course description

This course contains and describes all the basic phenomena and concepts of Chemical bonding in solids -- Crystal structures -- Mechanical properties -- Thermal properties of the lattice -- Electronic properties of metals --Semiconductors -- Magnetism -- Dielectrics - Superconductivity -- Finite solids and nanostructures.

2. Course Main Objective

On completion of the course, the student should be able to:

Understand the basic phenomena and concepts of solids and their structure and also the dielectric, magnetic and superconducting properties.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the nature and atomic structure of solid state materials	K1(I) K2(I)
1.2	Describe the physical properties of solid state matter.	K1(I) K2(I)
2	**Skills :**	
2.1	Explain appropriate theories, principles and concepts relevant to the solid-state physics.	S2(I)
2.2	Analyze the information from a variety of sources relevant to solid state physics.	S1(I)
3	**Values:**	
3.1	Apply standards of integrity and ethics in all tasks of solid state physics	V1(P)
3.2	Collaborate and contribute responsibly and effectively in teamwork	V2(P)

C. Course Content

No	List of Topics	Contact Hours
1	**Crystal Structure** • Introduction • Crystal Lattice and Translation Vectors • Unit Cell • Basis • Symmetry Operations • Point Group and Space Group • Types of Lattices • Lattice Directions and Planes • Interplanar Spacing • Simple Crystal Structures • Close-Packed Structures • Loose-Packed Structures • Structure of Diamond • Zinc Blende (ZnS) Structure • Sodium Chloride (NaCl) Structure	**12**
2	**Bonding in Solids** • Introduction • Interatomic Forces and Types of Bonding • Binding Energy in Ionic Crystals • Binding energy of Crystal of Inert Gases	**6**
3	**Free Electron Theory of Metals** • Drude-Lorentz's Classical Theory (Free electron gas) • Sommerfeld's Quantum Theory • Applications of Free Electron Gas Model	**6**
4	**Band Theory of Solids**	**6**

	• Introduction • The Bloch Theorem • The Kroning-Penney Model • Velocity and Effective Mass of Electron • Distinction between Metals, Insulators and Semiconductors.	
5	**Semiconductors** • Introduction • Pure or Intrinsic Semiconductors • Impurity of Extrinsic Semiconductors • Drift Velocity, Mobility and Conductivity of Intrinsic Semiconductors • Carrier Concentration and Fermi Level for Intrinsic Semiconductors. • Carrier Concentration and Fermi Level for Extrinsic Semiconductors.	**10**
Total		**40**

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 and Understanding**		
1.1	Define the nature and atomic structure of solid state materials	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, Power point 4. Discussions 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. e) Home work.
1.2	Describe the physical properties of solid state matter.		
2.0	**Skills**		
2.1	Explain appropriate theories, principles and concepts relevant to the 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.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 in solids.
2.2	Analyze the information from a variety of sources relevant to solid state physics.		
3.0	**Values**		
3.1	Apply standards of integrity and ethics in all tasks	• Search through the internet and use the library. • Small group discussion. • Enhance educational skills. • Develop their interest in Science through :(field trips, visits to scientific and research labs). • Encourage the student to attend lectures regularly • Give students tasks of duties	• Evaluate the efforts of each student in preparing the report. • Evaluate the work in team • Evaluation of students presentations
3.2	Collaborate and contribute responsibly and effectively in teamwork		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises, Participation, In-Class Problem Solving	All weeks	10 %
2	Quizzes & Home works	2^{th} -10^{th} week	10 %

#	Assessment task*	Week Due	Percentage of Total Assessment Score
3	Midterm exam	5^{th} -6^{th} week	30 %
4	Final exam	12^{th} 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 :

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

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1. Hofmann, Philip Solid state physics : an introduction Weinheim: Wiley-Vch, 2008
Essential References Materials	2. Solid State Physics, by R. K. Puri & V. K. Babbar 3^{rd} Edition (2008). 3. Walter A. Harrison/ Solid State Theory , Dover edition (1979).
Electronic Materials	
Other Learning Materials	4.Solid State Physics, by J. R. Hook & H. E. Hall 2^{nd} Edition (2010). 5. Solid State Chemistry and its Applications Second Edition Student Edition Antony West Weily 2014.

2. Facilities Required

This course is based upon main textbook and books related to the main subject .Additional materials can be developed specifically including:

- Lecture Notes and conferences
- Problem Sets (no solutions)
- Exams with Solutions

Students may spend about 40 hours learning solid state physics in the on-campus version of this course. That number comes from a combination of attending lectures and recitations, and studying independently. It’s difficult to estimate how long it will take you to complete all of the modules in this particular course, but you can probably expect to spend 3 to 4 hours on practice problems in semiconductors lab in level 11.

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	There are enough classrooms provided with a good accommodation
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
1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching	Teaching staff teams	Questionaries' Open discussion in the class room at the end of the lectures
2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department	Teaching staff teams	Revision of student answer paper by another staff member. Analysis the grades of students.
3. Processes for Improvement of Teaching	Teaching staff teams	Preparing the course as PPT. Using scientific movies. Periodical revision of course content.
4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)	Teaching staff and program leaders	After the agreement of Department and Faculty administrations

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	

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Education & Training Evaluation Commission

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Course Specifications

Course Title:	Anatomy and physiology
Course Code:	BIO2332
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

A. Course Identification

1. Credit hours: 6 (5+1)	
2. Course type	
a. University ☐ College √ Department ☐ Others ☐	
b. Required √ Elective ☐	
3. Level/year at which this course is offered: Level 6 /2nd year	
4. Pre-requisites for this course (if any)**:** General biology	
5. Co-requisites for this course (if any)**:** Anatomy and physiology lab.	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	50	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	50
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	80

B. Course Objectives and Learning Outcomes

1. Course Description

This course is interested in studying and recognize the meaning & importance of anatomy and physiology and its impact & complementary for
other health related sciences.
2.By the end of this course the students are expected to understand the normal functions and the anatomical structures of body organs and systems.
3.In addition students will acquire skill to deal with the common lab problems and situations facing them along their practical life followers of the physiological bases.

2. Course Main Objective

The students are expected to understand the normal functions and the anatomical structures of body organs and systems. upon which they will be able to build the further knowledge they will learn in later years

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Outlines about natural background radiation and other sources.	K2
1.2	List the RDLs for conventional x-ray, CT, Mammogram	K2
1.3	Describe calibration of thermoluminescence dosimeters	K1
1.4	State operational radiation quantities	K5
2	**Skills :**	
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2.3	Integrate information technology (IT) based solution into radiation.	S2
2...		
3	**Values:**	
3.1	Appraise the cooperation through teamwork to make a decision.	V1
3.2	The student knows how to analyze obtained data and how to manage it.-	V1
3.3	Knowledge and capability of students to use computers and internet.	V2
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**1. Cells, tissues and organs** The cell membrane Cell-eating and drinking Cytoplasm The nucleus and DNA Cell division Mitochondria and cellular respiration Tissue types Epithelial cells Connective tissue Dense and specialized connective tissue Muscle tissue Voluntary muscle Smooth muscle Cardiac muscle Nervous tissue Organs and organ systems	5
2	**4. Skeletal system Muscle** Organisation of skeletal muscles Skeletal system Skull and sinuses Spine and ribs Ossicles and hyoid bone Appendicular skeleton Foot bones	5

	Bone tissue Ossification Growth plates Bone structure Compact and spongy bone Bone marrow	
3	**Blood** Plasma Plasma proteins Blood cell differentiation Haemoglobin Carbon monoxide Erythrocytes Erythropoiesis ABO blood types and transfusion	5
4	**Immunity** Types of immunity Skin and secretions Commensals Mucus Self and non-self Parasites Toxoplasma gondii Worms Fungus and yeast Bacteria Viruses	5
5	**Cardiovascular system** Circulation Arteries and veins Capillaries Hydrostatic pressure Fluid exchange The heart Pericardium Myocardium and endocardium Four chambers, four vessels, four valves Right side of the heart Left side of the heart Aorta The cardiac cycle	5
6	**Respiratory system** Lungs Respiration Air and altitude Partial pressure Airways Nasal cavity Warming and humidifying Pharynx Eustachian drainage	5

	Oropharynx Larynx Speech Trachea	
7	**Renal system** Urinary tract Kidneys Drainage Nephron Filtration Reabsorption Secondary active transport Water and glucose transport Secretion and hydrogen ions Urine Fluid balance	5
8	**Digestive system** Metabolism Carbohydrate Fibre and protein Fats and cholesterol Vitamins and minerals Hunger and satiety Leptin and body mass index The peritoneum Gastric smooth muscle and mucosa The mouth and salivary glands Swallowing Stomach Gastric secretions	5
9	**Nervous system** Central nervous system Peripheral nervous system Motor and sensory nerves Neurons Action potentials Synapses and neurotransmitters Microglia, ependymal cells, satellite cells and Schwann cells Neuron damage Pain transmission	5
10	**Endocrine system & Reproductive system** Hormones Receptors Hypothalamus Anterior pituitary hormones Thyroid Adrenal gland Male reproductive system Female reproductive system	5
Total		50

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 and Understanding**		
1.1	Describe the structure and classes of the different systemic organs of the body: Respiratory passages structure, Gastrointestinal tract, Renal system, Special senses, Endocrine system, Nervous system, Female genital system	Introductory lecture gives an overview of the content and significance of the course and of its relationship to students' existing knowledge. Lectures Seminars	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminescence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
2.3	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
3.3	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Homework, Quiz	All weeks	10 %
2	Midterm's exam	8th week	20 %

3	Lab.	10^{th} week	20 %
4	Final Exam (theoretical)	13^{th} 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- Human Biology 16th Edition Sylvia Mader and Michael Windelspecht McGraw-Hill Education ISBN:9781260233032 2- Introduction to anatomy and physiology for healthcare students David Sturgeon 2018 by Routledge ISBN: 978-1-138-68386-0
Essential References Materials	
Electronic Materials	List Electronic Materials Web Sites, Facebook, Twitter, etc. www.pubmed.com http://www.innerbody.com www.inner body.com www.Bartleby.com www.en.wikipedia.org/wiki/anatomy www.mic.ki.se/anatomy
Other Learning Materials	Multimedia associated with the textbooks and the relevant websites Lecture notes Acland’s video

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

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Education & Training Evaluation Commission

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Course Specifications

Course Title:	**Fundamentals of Electronics**
Course Code:	PHY2612-5
Program:	**B.Sc. Medical Physics**
Department:	**Physics**
College:	**Applied Science**
Institution:	**UMM AL – QURA UNIVERSITY**

Table of Contents

A. Course Identification

1. Credit hours: 5 (4+1)	
2. Course type	
a. University ☐ College ☐ Department ☑ Others ☐	
b. Required ☑ Elective ☐	
3. Level/year at which this course is offered: 2^{th} **Year / Level 6**	
4. Pre-requisites for this course (if any)**:** Electricity and magnetism (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	4	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	4 hours a week
2	Laboratory/Studio	3 hours a week
3	Tutorial	-
4	Others (specify)	-
	Total	70

B. Course Objectives and Learning Outcomes

1. Course Description

This course offers the fundamentals knowledge on electronics; it covers an introduction on conduction mechanisms in semiconductors, devices as pn junction (diode) and some applications of diode in electrical circuits. Treats the characteristics, application of Bipolar junction transistors and the Field effect transistors. Presents the Operational amplifiers and its applications.

2. Course Main Objective

1-Understanding the properties of electronic devices as diode or transistors

2-This course help students to understand electrical circuit analysis.

3- The course introduces basic principles of amplification of weak electrical signals.

3. Course Learning Outcomes

	CLOs	AlignedPLOs
1	**Knowledge and Understanding**	
1.1	Define the characteristic of diode and transistor	K1(I)
1.2	Describe the electrical mechanism in electronic device.	K2(I)
2	**Skills :**	
2.1	Solve the problems using electrical circuit analysis	S2(I)
2.2	Explain the signal treatment in electronic device	S1(I)
3	**Values:**	
3.1	Apply standards of integrity and ethics of electronic device	V1(P)
3.2	Collaborate and contribute responsibly and effectively in teamwork	V2(P)

C. Course Content

No	List of Topics	Contact Hours
1	**Semiconductor Basics** • Semiconductors, Conductors, and Insulators • Covalent Bonds, Conduction in Semiconductors • N-Type and P-Type Semiconductors • The Diode, Biasing a Diode , Voltage-Current Characteristic of a Diode	**6**
2	**Diode Applications** • Half- Wave Rectifiers, Full-Wave Rectifiers • Power Supply Filters and Regulators • Diode Limiting and Clamping Circuits	**4**
3	**Specials diodes** • Zener Diodes, Zener diode applications, Varactor Diodes • Optical Diodes	**2**
4	**Bipolar Transistors (BjTs)** • Transistor Structure, Basic Transistor Operation • Transistor Characteristics and parameters • The Transistor as an Amplifier, the Transistor as a Switch	**4**
5	**Transistor Bias Circuits** • The DC Operating Point, Voltage-Divider Bias • Other Bias Methods	**2**
6	**BjT Amplifiers** • Amplifier Operation, transistor AC Equivalent Circuits • The Common-Emitter, Collector , Base Amplifier • The Differential Amplifier	**4**
7	**Field Effect Transistor (FETs)** • The JFET, Characteristics , Parameters and Biasing • MOSFET Characteristics and parameters, FET Amplifiers	**4**
8	**Power Amplifiers** • Class A Power Amplifiers • Class B and Class AB Push-Pull Amplifiers • Class C Amplifiers	**4**
9	**Amplifier Frequency Response** • Basic Concepts, Low-Frequency and high-Frequency Amplifier	**4**

	Response , total Amplifier Frequency Response • Frequency Response of Multistage Amplifiers	
10	**Operational Amplifiers** • Introduction to Operational Amplifiers, Op-Amp Input Modes and Parameters • Some Typical op-amp Circuits, Negative Feedback	**4**
11	**The oscillator** • Oscillators with *RC* Feedback Circuits • Oscillators with *LC* Feedback Circuits • The 555 Timer as an Oscillator	**2**
Total		**40**

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 and Understanding**		
1.1	Define the characteristic of diode and transistor	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, Power point 4. Discussions 5. 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. e) Home work
1.2	Describe the electrical mechanism in electronic device.		
2.0	**Skills**		
2.1	Solve the problems using electrical circuit analysis	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	a. Midterm's exam. Exams, short quizzes b. Asking about physical laws previously taught c. Writing reports on selected parts of the course d. Discussions of how to simplify or analyze some phenomena in solids.
2.2	Explain the signal treatment in electronic device		
3.0	**Values**		
3.1	Apply standards of integrity and ethics of electronic device	1.Search through the internet and use the library. 2. Small group discussion. 3. Enhance educational skills. 4. Develop their interest in Science through :(field trips, visits to scientific and research labs).	a. Evaluate the efforts of each student in preparing the report. b. Evaluate the work in team c. Evaluation of students
3.2	Collaborate and contribute responsibly and effectively in		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
	teamwork	5.Encourage the student to attend lectures regularly 6. Give students tasks of duties	

2. **Assessment Tasks for Students**

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes & Home works	Every week	5%
2	Exercises, Participation, In-Class Problem Solving	Every week	5%
3	Midterm Exams	6th ,10th week	20%
4	Lab	Every week	20%
5	Final exam	12th week	50%
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 :

Each student will be supervised by academic adviser in physics Department and academic support time table is given to the student. (O.H. 4 hrs a week)

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	ELECTRONIC DEVICES, Ninth Edition, Thomas L. Floyd
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Lecture room for 30 students Laboratory for electronics, there is a special course for laboratory related to electronics

Item	Resources
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)	Library

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Questionnaires’	teachers	Open discussion in the class room at the end of the lectures

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	

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Course Specifications

Course Title:	**Introduction to Nuclear Physics**
Course Code:	**PHY2511-5**
Program:	**Medical Physics**
Department:	**Physics**
College:	**Faculty of Applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours: 5 (4+1)	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: 6/2nd year	
4. Pre-requisites for this course (if any)**:** Fundamentals of Quantum Mechanics	
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**	40	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	40
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Basic nuclear physics: Nuclides, isotopes, nuclear chart, nuclear mass, binding energy and stability, nuclear force, and nuclear structure models.

The course follows the textbook “Introductory Nuclear Physics” by Krane to Chapter 5 (Unit I Basic Nuclear Structure)

2. Course Main Objective

At the end of the course the students should be familiar with the following aspects of Nuclear Physics: the structure of nuclei, and simple nuclear models such as the liquid drop model and the shell model.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define basic concepts of nuclear physics.	K1-I
1.2	Identify the models describing the basic nucleon and nuclear properties	K2-P
1.3	Describe nuclear structure.	K2-P
1...		
2	**Skills :**	
2.1	Calculate nuclear binding energy and nuclear masses.	S1-P
2.2	Formulate nuclear force	S1-P
2.3	Interpret the magic numbers of the nucleus.	S2-P
2.4		
3	**Values:**	
3.1	Apply basic nuclear physics calculations and measurements.	V1
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Basic properties: Terminology, Units and Dimensions – Nuclear radius-Distribution of Nuclear charge	4
2	Nuclear properties: Liquid drop model: Stable nuclei- Binding energy- Semi empirical mass formula.	4
3	Nuclear properties: Spin and parity: Angular Momentum and Parity- Nuclear Electromagnetic Moments- Nuclear excited states.	4
4	Nuclear Force: The Deuteron- Binding energy- Spin and parity	4
5	Magnetic and Electric dipole moments of Deuteron	
6	Nucleon-Nucleon Scattering.	4
7	Properties of the nuclear force- The exchange Force Model	4
8	Nuclear structure: The Shell Model predictions - Magic numbers.	4
9	Spin-orbit interactions -Magnetic Dipole and Electric Quadrupole Moments	4
10	Excited states of nuclei (Nuclear Vibrations and rotations).	4
Total		40

D. Teaching and Assessment

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

<table>
<tr><th>Code</th><th>Course Learning Outcomes</th><th>Teaching Strategies</th><th>Assessment Methods</th></tr>
<tr><td>1.0</td><td colspan="3">Knowledge and Understanding</td></tr>
<tr><td>1.1</td><td>Define basic concepts of nuclear physics.</td><td rowspan="3">Lectures Discussion-solve problems</td><td rowspan="3">Short quizzes, periodical and final exams.</td></tr>
<tr><td>1.2</td><td>Identify the models describing the basic nucleon and nuclear properties</td></tr>
<tr><td>1.3</td><td>Describe nuclear structure.</td></tr>
<tr><td>2.0</td><td colspan="3">Skills</td></tr>
</table>

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.1	Calculate nuclear binding energy and nuclear masses.	Lectures Discussion-solve problems	Short quizzes, periodical and final exams.
2.2	Formulate nuclear force		
2.3	Interpret the magic numbers of the nucleus.		
3.0	**Values**		
3.1	Apply basic nuclear physics calculations and measurements.	Lectures -Discussion	Short quizzes, periodical and final exams
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises and HomeWorks	All weeks	10%
2	Participation in activities	All weeks	10%
3	Mid-term exam	5^{th} week	30%
4	Final exam	12^{th} 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.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1- Krane, Kenneth S. *Introductory Nuclear Physics*. 3rd ed. John Wiley & Sons, 1987. ISBN: 9780471805533. 2- K. Heyde, Basic Ideas and Concepts in Nuclear Physics, (3rd edn CRC Press 2004). ISBN: 978-0750309806
Essential References Materials	1- A. Das and T. Ferbel, Introduction to Nuclear and Particle Physics by World Scientific Publishing; 2nd edition (2003), ISBN-13: 978-9812387448
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, etc.)	
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 and assessment	Students	Questionnaire
Effectiveness of Student evaluation	Instructor	Exams
Extent of achieving 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	Prof. Khaled Abdel-Waged
Reference No.	
Date	

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Course Specifications

Course Title:	Health Physics
Course Code:	PHYM3303-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 7 /3rd year	
4. Pre-requisites for this course (if any)**:** Introduction to nuclear physics	
5. Co-requisites for this course (if any)**:** NIL	

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	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

An introduction to the field of Health physics, which concentrates on the fundamentals of radiation and radiation protection; including types of ionizing and non-ionizing radiation, radioactive decays, interaction of radiation with matter, biological effects of exposure to low level radiation, radiation detection and measurement, radiation protection methods and techniques, and radioactive waste disposal. Lectures will include use of radiation and personal exposures in the categories of environmental radiation, medical applications, consumer products, industrial uses, research uses, and military uses, moreover, various types of sensors and measurement apparatus used for the calibration of medical imaging and therapy systems will receive particular attention

2. Course Main Objective

At the end of this course, the student should be able to:
- Establish the ubiquitous nature of radiation and the many technologies in his society which utilize radiation or radioactive materials.
- Provide the basic understanding of radiation and radioactive decay.
- Explain the biological effects of exposure to radiation.
- Demonstrate how radiation can be detected and dose measured

- Provide the basis for radiation protection and keeping exposure to As Low as Reasonable Achievable (ALRA). - Provide a realistic perspective on the radioactive waste disposal.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Outline the Different Types of Health Physics Instrumentations	K2
1.2	Recognize the Types of Radioactive Wastes and Environmental Monitoring Program	K4
1.3	Recognize occupational and public exposure limits in addition to the safety requirement	K3
1.4	List source of radiation	K1
2	**Skills :**	
2.1	The ability to explain the different types of radiation interactions with matter	S1
2.2	The ability to analyze merits and drawbacks of different health physics instrumentations	S2
2.3	The ability to explain the international dispersal of radioactive materials and the accident sequence.	S3
2...		
3	**Values:**	
3.1	Research to solve selected cases in field.	V3
3.2	Demonstrate the use of health physics instrumentations in different fields.	V2
3.3	Ilustrate the Protocol of Health Physics Safety and Radioactive waste Disposal	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**NONIONIZING RADIATION** Introduction Units UV Light Lasers Radiofrequency Radiation and Microwaves	6
2	**Visible Light** Introduction Physics of visible light Biological Effects of visible light Applications of Therapeutic Effects of visible light	6
3	**Ultraviolet** Introduction Physics & types of ultraviolet Biological Effects of ultraviolet Applications of Therapeutic Effects of ultraviolet	6

	Protection from UV	
4	**Infrared** Introduction Physics & type of infrared Biological Effects of infrared Applications of Therapeutic Effects of infrared Protection from IR	6
5	**Electromagnetic Fields** Introduction Physics & type of electromagnetic fields Biological Effects of electromagnetic fields Applications of Therapeutic Effects of electromagnetic fields	6
…		
Total		

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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
1.3	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
2.3	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
			reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
3.3	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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-Introduction to Health Physics Thomas E. Johnson 2017 by McGraw-Hill ISBN: 978-0-07-183526-8 2-Non-ionizing Radiation Protection by Andrew W. Wood 2017 Wiley
Essential References Materials	Biological Effects of Electromagnetic Fields Peter Stavroulakis 2003 Springer- ISBN 978-3-642-07697-8
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation	Classrooms

Item	Resources
(Classrooms, laboratories, demonstration rooms/labs, etc.)	
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

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Course Specifications

Course Title:	Instrumentation for Medical Physics
Course Code:	PHYM3304-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 7 /3rd year	
4. Pre-requisites for this course (if any): Fundamentals of Electronics	
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	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

Concepts of medical instrumentation, transducers, and medical electronics design. Various types of sensors and measurement apparatus used for the calibration of medical imaging and therapy systems will receive particular attention. The primary focus is on the methods required to reconstruct images within each modality, with emphasis on the resolution, contrast, and signal-to-noise ratio of the resulting images. Students will additionally engage in hands-on activities to reconstruct medical images from raw data.

2. Course Main Objective

An introduction to the physics, instrumentation, and signal processing methods used in general radiography, X-ray computed tomography, ultrasound imaging, magnetic resonance imaging, and nuclear medicine. The primary focus is on the methods required to reconstruct images within each modality, with emphasis on the resolution, contrast, and signal-to-noise ratio of the resulting images. Students will additionally engage in hands-on activities to reconstruct medical images from raw data.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	To recognize facts, principle and concepts of elementary medical Physics	K3
1.2	To understand the physical laws of human bod equilibrium	K2
1.3	Describe concepts, Procedures of some experiments in medical physics	K2
1...		
2	**Skills :**	
2.1	Apply the laws of medical physics.	S2
2.2	Solve problems in Physics by using suitable mathematical principles	S1
2.3	Analyse and interpret quantitative results	S3
2...	Express the medical physical phenomena mathematically.	S1
3	**Values:**	
3.1	Collect and classify the material for a course	V1
3.2	Use basic medical physics terminology in English	V2
3.3	Acquire the skills to use the internet communicates tools.	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	1. Electrophysiological Measurements 2. Electrocardiography	3
2	3. Circulatory System 4. Electroencephalogram	3
3	5. Electromyography (EMG) 6. Respiratory Testing Instruments	3
4	7. ENT and Opthalmic Instruments 8. Ultrasound Medical Diagnostic Instrumentation	3
5	9. X-Ray Instruments 10. CT Scanning	3
6	11. Magnetic Resonance Imaging (MRI) 12. Surgical Instruments	3
7	13. Some New Development in Medical Instruments 14. Signal Processing in Medical Instruments	3
8	15. Safety Measures in Bio-Medical Instruments 16. Electro Chemical Instruments	3
9	17. Patient Monitoring System and Bio-Telemetry 18. Practical Electronic Laboratory Experiments	3
10	19. Recorders in Medical Instruments 20. Computers and Medical Data Base Management Including Web	3

...		
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 and Understanding**		
1.1	Recognize facts, principle and concepts of elementary medical Physics	1- Demonstrating the basic principles through lectures.	Recognize facts, principle and concepts of elementary medical Physics
1.2	Describe concepts, Procedures of some experiments in medical 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**		
2.1	Apply the laws of medical 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		
…	Analyse and interpret quantitative results		
	Express the medical physical phenomena mathematically.		
3.0	**Values**		
3.1	Communicate effectively in oral and written form	• Homework • Preparing a report on some topics related to the course depending on web sites.	• Evaluation of presentations • Evaluation of reports • Practical exam • Homework. Final exams.
3.2	Collect and classify the material for a course		
…	Use basic medical physics terminology in English		
	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 & Homework	All weeks	10 %
2	Midterm's exam	All weeks	30 %
3	Quiz	8th week	10 %
4	Final Exam (theoretical)	13th 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	A Textbook of Medical Instruments by S. Ananthi 2005, New Age International ISBN (13) : 978-81-224-2870-4
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

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Course Specifications

Course Title:	Medical radiation Physics (1)
Course Code:	PHYM3503-4
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

A. Course Identification

1. Credit hours: 4 (3+1)	
2. Course type **a.** University ☐ College ☐ Department ☑ √ Others ☐ **b.** Required √ Elective ☐	
3. Level/year at which this course is offered: Level 7 /3rd year	
4. Pre-requisites for this course (if any)**:** Introduction to Nuclear Physics	
5. Co-requisites for this course (if any)**:** Medical radiation Physics (1) lab.	

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	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	70

B. Course Objectives and Learning Outcomes

1. Course Description

This course is interested in studying the natural back ground radiation and medical sources, Conventional x-ray dosimetry, Computed tomogram dosimetry, mammogram dosimetry and nuclear medicine dosimetry. In addition to study the concept and measurement of ambient dose equivalent, directional dose equivalent and personal equivalent it interested in managing radioactive contamination, decontamination factor and assessment of skin dose due to decontamination.

2. Course Main Objective

This course aims to provide students with Elements of Atomic & Nuclear Physics, Atomic & Nuclear structure, General introduction to the properties of radiation and matter, Atom, Nucleus, AMU, Nuclear forces, Electromagnetic Radiation. Radiological Units.

Nuclear Transformation: Radioactivity, General properties & production of radioactive Materials, Radioactive decay, Half-life, Mean-life, Transient & Secular equilibrium, Isotopes

used in medicine. Nuclear reaction. Interaction of Ionizing radiation with matter. Photoelectric, Compton effects & pair production Processes & their clinical importance. Attenuation & absorption coefficients. Exponential law, Half value layer & simple calculations.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Outlines about natural background radiation and other sources.	K2
1.2	List the RDLs for conventional x-ray, CT, Mammogram	K2
1.3	Describe calibration of thermoluminscence dosimeters	K1
1.4	State operational radiation quantities	K5
2	**Skills :**	
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2.3	Integrate information technology (IT) based solution into radiation.	S2
2...		
3	**Values:**	
3.1	Appraise the cooperation through teamwork to make a decision.	V1
3.2	The student knows how to analyse obtained data and how to manage it.-	V1
3.3	Knowledge and capability of students to use computers and internet.	V2
3...		

C. Course Content

No	List of Topics	Contact Hours
1	IONIZING RADIATION I. Introduction II. Types and Sources of Ionizing Radiations Ill. Description of Ionizing Radiation Fields A. Consequences of the Random Nature of B. Simple Description of Radiation Fields C. Differential Distributions vs. Energy and D. An Alternative Definition of Fluence E. Planar Fluence	6
2	QUANTITIES FOR DESCRIBING THE INTERACTION OF IONIZING RADIATION WITH MATTER I. Introduction II. Kerma III. Absorbed Dose IV. Comparative Examples of Energy Imparted, V. Exposure VI. Quantities and Units for Use in Radiation Levels	3
3	EXPONENTIAL ATTENUATION 1. Introduction II. Simple Exponential Attenuation 111. Exponential Attenuation for Plural Modes of IV. Narrow-Beam Attenuation of Uncharged V. Broad-Beam Attenuation of Uncharged VI. Some Broad-Beam Geometries	6

	VII. Spectral Effects VIII. The Buildup Factor IX. The Reciprocity Theorem	
4	INTERACTIONS OF CHARGED PARTICLES WITH MATTER 1 General Aspects of Energy Transfer from Charged Particle to Medium 2-General Aspects of Stopping Power 3-Radiation (Nuclear) Stopping Power 4-Collision (Electronic) Stopping Power for Heavy Charged Particles 5-Collision Stopping Power for Light Charged Particles 6-Range of Charged Particles	3
5	INTERACTIONS OF PHOTONS WITH MATTER 1 General Aspects of Photon Interactions with Absorbers 2-Thomson Scattering 3-Incoherent Scattering (Compton Effect) 4-Rayleigh Scattering 5-Photoelectric Effect 6-Pair Production 7-Photonuclear Reactions	3
6	ABSORBED DOSE IN RADIOACTIVE MEDIA I. Introduction 11. Radioactive Disintegration Processes A. Alpha Disintegration B. Beta Disintegration C. Electron-Capture (EC) Transitions D. Internal Conversion vs. Y-Ray Emission E. Tables for Dose Estimation	3
7	RADIOACTIVE DECAY I. Total Decay Constants II. Partial Decay Constants 111. Units of Activity IV. Mean Life and Half-Life V. Radioactive Parent-Daughter Relationships VI. Equilibria in Parent-Daughter Activities VII. Removal of Daughter Products	3
8	INTERACTIONS OF NEUTRONS WITH MATTER 1 General Aspects of Neutron Interactions with Absorbers 2 Neutron Interactions with Nuclei of the Absorber 9.3 Neutron Kerma 9.4 Neutron Kerma Factor 9.5 Neutron Dose Deposition in Tissue	3
...		
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
…	Describe calibration of thermoluminscence dosimeters	with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
2.3	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
3.3	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Midterm's exam	All weeks	20 %
3	Lab.	8th week	20 %
4	Final Exam (theoretical)	13th 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-Radiation Physics for Medical Physicists 3rd ed Ervin B. Podgoršak Springer 2016 ISBN 978-3-319-25380-0 2-Introduction to radiological physics and radiation dosimetry Frank Herbert- Wiley 2004, ISBN-13: 978-0-471-01 146-0
Essential References Materials	3- Compendium to Radiation Physics for Medical Physicists: 300 Problems and Solutions Ervin B. Podgoršak Springer 2014 ISBN 978-3-319-25380-0
Electronic Materials	www.iomp.org www.aapm.org www.afomp.org/
Other Learning Materials	The following journals are recognized as official publications of the IOMP: 1. Physics in Medicine and Biology 2. Physiological Measurement 3. Medical Physics 4. Journal of Applied Clinical Medical Physics 5. Medical Physics International

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	Physics of Medical Laser
Course Code:	PHYM3305-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 11 /4th year	
4. Pre-requisites for this course (if any): Physics of Medical Imaging (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**	30	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	30
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course is dedicated to medical physics students to teach and introduce the uses of LASER in medicine and surgeries. It starts with describing the atom, and excitation. It then describes how LASER is formed and the associated conditions for LASER formation. It also introduces various types of LASER like gas LASER, Solid LASER and Dye LASER. Next, it describes how the laser beam is transferred in fibers and the biological effects on the different human tissues. Finally it gives an introduction to the laser applications in ophthalmology as an example.

2. Course Main Objective

1. To promote acquisition of knowledge of the main use of lasers in medicine and to provide a basic understanding of tissue optics. 2. To provide theoretical knowledge of lasers and intense pulsed light therapy applications in medicine. 3. To teach students to evaluate the impact of lasers on the human body, tissues and to predict the changes in laser power; know security tools, basic rules and standards for working with lasers; use and follow safety rules at work with lasers

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Solve problems in Physics by using suitable mathematical principles	K1
1.2	Applying biological information to the use of laser	K2
1.3	Express the physical phenomena mathematically.	K3
1...		
2	**Skills :**	
2.1	Recognize facts, principle and concepts of laser formation	S1
2.2	Analyse and interpret quantitative results	S2
2.3	Acquire the skills to use the internet communicates tools.	S3
2...		
3	**Values:**	
3.1	Collect and classify the material for a course	V2
3.2	Use basic physics terminology in English	V3
3.3	Communicate effectively in oral and written form	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Basic Physics of Lasers** Amplifier with Feedback Laser Design Laser Radiation Laser Types Nd:YAG Lasers Argon and Krypton Ion Lasers HeNe Lasers CO2 Lasers Dye Lasers Excimer Lasers Erbium: YAG Laser Holmium:YAG Laser Ruby Laser Diode Lasers Metal-Vapour Lasers	6
2	**Action Mechanisms of Laser Radiation in Biological Tissues** Properties of Biological Tissues Interactions of Laser Radiation with Biological Tissue Photochemical Effects Thermal Effects "Thermal" and "Non-Thermal" Effects on Tissues Non-Linear Processes	3
3	**Technical Basics of Medical Laser Systems** Basic Device Dose-Effect-Controlled N d: YAG Laser System for the Cutting of Tissues	6

	Beam-Handling Systems Light Guides Optical Applicators Laser Applicators for Interstitial Coagulation Laser Medicine - Technology and Dosimetry	
4	**Principles of Laser Application in Medicine** The Laser's Position in Medicine Fundamentals of Nd: VAG Laser Applications Additional Equipment Therapeutic Guidelines Laser-Induced Thermotherapy (LITT), Basics Basics of Photodynamic Therapy	6
5	**Laser Application in Medicine** Laser Stereotaxy Laser Applications in Ophthalmology Dental Laser Applications: Periodontal Treatment and Intra-Oral Surgery	3
6	**Laser Application in Medicine** Angiology Laser Treatments in Plastic Surgery Open and Endoscopic Laser and Dermatology	3
7	**Laser Safety in Medicine** Guidelines for Safe Clinical Laser Applications	3
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	**Knowledge and Understanding**		
1.1	Solve problems in Physics by using suitable mathematical principles	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, multimedia 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.
1.2	Applying biological information to the use of laser	1. Applying the principles to realistic physics problems. 2. Show the best ways to solve the problems	Home work. Discussions during the class.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		3. Show the best ways to demonstrate the results. 4. Discussion with the student about the results.	
1.3	Express the physical phenomena mathematically.	1- Demonstrating the basic principles through lectures. 2. Discussing phenomena with illustrating pictures and diagrams 3. Lecturing method: Board, multimedia	Home work. Discussions during the class.
1...			
2	**Skills :**		
2.1	Recognize facts, principle and concepts of laser formation	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 methods previously taught 3.Discussions of how to simplify or analyze some phenomena
2.2	Analyse and interpret quantitative results		
2.3	Acquire the skills to use the internet communicates tools.		
2...			
3	**Values:**		
3.1	Collect and classify the material for a course	• Homework • Preparing a report on some topics related to the course depending on web sites.	• Evaluation of presentations • Evaluation of reports • Practical exam • Homework. Final exams.
3.2	Use basic physics terminology in English		
3.3	Communicate effectively in oral and written form		
3...			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8^{th} week	30 %
4	Final Exam (theoretical)	13^{th} 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	Applied Laser Medicine -H.-Peter Berlien Springer- 2003 ISBN 978-3-642-62391-2
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	Radiobiology
Course Code:	PHYM3501-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 7 /3rd year								
4. Pre-requisites for this course (if any)**:** Anatomy and physiology								
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	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course is interested in studying the natural back ground radiation and medical sources, Conventional x-ray dosimetry, Computed tomogram dosimetry, mammogram dosimetry and nuclear medicine dosimetry. In addition to study the concept and measurement of ambient dose equivalent, directional dose equivalent and personal equivalent it interested in managing radioactive contamination, decontamination factor and assessment of skin dose due to decontamination.

2. Course Main Objective

An introduction to radiation biology. This course covers the biological effects of radiation, including mechanisms of DNA damage, and normal tissue injury. radiation biology data, radiation action at the cellular and tissue level; radiation effects on human populations, carcinogenesis, genetic effects; radiation protection; tumor control, normal-tissue complication probabilities.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Outlines about natural background radiation and other sources.	K2
1.2	List the RDLs for conventional x-ray, CT, Mammogram	K2
1.3	Describe calibration of thermoluminescence dosimeters	K1
1.4	State operational radiation quantities	K5
2	**Skills :**	
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2.3	Integrate information technology (IT) based solution into radiation.	S2
2...		
3	**Values:**	
3.1	Appraise the cooperation through teamwork to make a decision.	V1
3.2	The student knows how to analyze obtained data and how to manage it.-	V1
3.3	Knowledge and capability of students to use computers and internet.	V2
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**1. Cell Biology** 1.1 Cell Biology 1.2 Biochemistry 1.3 Structure of the Cell 1.4 Cellular Components 1.5 Communication of Cells with Their Environment 1.6 Cell Metabolism 1.7 Life Cycle of the Cell 1.8 Cellular Abnormalities	3
2	**A Brief Review of Cancer** 2.1 Definition 2.2 Global Cancer Facts and Figures 2.3 Characteristics and Causes of Cancer Cells 2.4 Types of Cancer 2.5 Cancer Stem Cell Theory 2.6 Tumor Microenvironment 2.7 Carcinogenesis 2.8 Cancer as a Genetic Disease 2.9 Classification of Cancer 2.10 Methods to Diagnose Cancer 2.11 Cancer Treatment 2.12 Radiation in Cancer Treatment	4
3	**Interaction of Radiation with Cells** 3.1 Concepts of Microdosimetry 3.2 Various Stages of Interaction of Radiation with Cells	4

	3.3 Interaction of Radiation with Cells at the Atomic Level 3.4 Interaction of Radiation with Cells at the Molecular Level 3.5 Interaction of Radiolysis Products with Biomolecules . 3.6 Effects of Radiation at the Cellular Level	
4	**4. Radiation Response Modifiers** 4.1 Introduction 4.2 Physical Factors 4.3 Biological Factors 4.4 Chemical Factors .	3
5	**5. Biological Effects of Radiation: Deterministic Effects** 5.1 Introduction 5.2 Early Deterministic Effects of Radiation 5.3 Late Deterministic Effects of Radiation	4
6	**6. Biological Effects of Radiation: Stochastic Effects—Carcinogenesis** 6.1 Experience on Radiation Carcinogenesis 6.2 Radiation Epidemiology 6.3 Linear Nonthreshold (LNT) Hypothesis 6.4 Dose and Dose Rate Effectiveness Factor (DDREF) 6.5 Cancer Risk Estimation 6.6 Types of Cancer Caused by Radiation Exposure 6.7 Second Cancers in Radiotherapy Patients 6.8 Cancer Risks from Diagnostic Radiology 6.9 Attributable Lifetime Risk	6
7	**7. Biological Effects of Radiation: Stochastic Effects—Genetic** Effects 7.1 Genetic Effects of Radiation: Introduction 7.2 Genetic Diseases in Humans 7.3 Genetic Risk Estimation 7.4 Background Data from Humans and Other Animals	3
8	**8. Radiobiological Models** 8.1 Importance of Radiobiological Models 8.2 Models Based on Empirical Isoeffect 8.3 Models Based on Cell Survival Curves and Isoeffect 8.4 TCP- and NTCP-Based Models	3
...		
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
…	Describe calibration of thermoluminescence dosimeters	with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
2.3	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
3.3	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8^{th} week	30 %
4	Final Exam (theoretical)	13^{th} 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-Radiation Biology for Medical Physicists C. S. Sureka, 2017 2-Radiobiology for radiologist Hall, Eric J.,
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	Medical radiation Physics (2)
Course Code:	PHYM3504-4
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

A. Course Identification

1. Credit hours: 4 (3+1)	
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐	
3. Level/year at which this course is offered: Level 8 /3rd year	
4. Pre-requisites for this course (if any)**:** Medical Radiation Physics (1)	
5. Co-requisites for this course (if any)**:** Medical Radiation Physics (2) lab.	

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	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	70

B. Course Objectives and Learning Outcomes

1. Course Description

This course is interested in studying the natural back ground radiation and medical sources, Conventional x-ray dosimetry, Computed tomogram dosimetry, mammogram dosimetry and nuclear medicine dosimetry. In addition to study the concept and measurement of ambient dose equivalent, directional dose equivalent and personnal equivalent . it interested in managing radioactive contamination , decontamination factor and assessment of skin dose due to decontamination .

2. Course Main Objective

At the end of this course the students will be able to:

1- Acquire basics of exposures by cosmic radiation and cosmogenic radionuclides, origin and Factors affecting on exposure to cosmic radiation ,Internal exposures to human from terrestrial radiations.

2.List the Reference Dose level (RDLs) in diagnostic Radiology, conventional x-ray and CT.

3-Acquire the basic of the radiation protection quantities and units, and operational quantities.

4-Calculate the entrance skin dose for patients undergoing diagnostic X-ray.

5-Describe types of phantoms of the human body.

6- Acquire information about occupational exposures and Environmental source geometries

7- Acquire different methods for external dosimetry.
8- List the different route of radionuclides intime.
9-Calculate the internal dose using Medical Internal Radiation Dose, MIRD method.
10- Acquire procedure of direct measurement of internal dosimetry.
11- Describe the methods for decontamination.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Outlines about natural background radiation and other sources.	K2
1.2	List the RDLs for conventional x-ray, CT, Mammogram	K2
1.3	Describe calibration of thermoluminscence dosimeters	K5
1.4	Describe different methods of medical internal dosimetry	K5
2	**Skills :**	
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2.3	Integrate information technology (IT) based solution into radiation.	S2
3	**Values:**	
3.1	Appraise the cooperation through teamwork to make a decision.	V3
3.2	The student knows how to analyse obtained data and how to manage it.-	V4
3.3	Justify a short report in a written form and perform effective communication with colleagues and faculty members.	V3
3...	Appraise the ability of students to use programs designed for medical internal radiation dose software and enhancing their ability to interpret the results.	V1

C. Course Content

No	List of Topics	Contact Hours
1	DOSIMETRY FUNDAMENTALS I. Introduction A. What Is Radiation Dosimetry? B. What Is a Dosimeter? C. Simple Dosimeter Model in Terms of II. General Guidelines on the Interpretation of Cavity Theory Dosimeter Measurements A. For Photons and Neutrons B. For Charged Particles A. Absoluteness B. Precision and Accuracy C. Dose Range D. Dose-Rate Range E. Stability F. Energy Dependence G. Miscellany	6
2	IONIZATION CHAMBERS I. Introduction II. Free-Air Ion Chambers III. Cavity Ionization Chambers	3

	IV. Charge and Current Measurements V. lon-Chamber Saturation and Ionic Recombination VI. Ionization, Excitation and W	
3	DOSIMETRY AND CALIBRATION OF PHOTON AND ELECTRON BEAMS WITH CAVITY ION CHAMBERS I. Introduction II. Absolute Cavity Ion Chambers III. Calibration of Ion Chambers Using X-Rays or gamma-Rays IV. Calibration of Photon Beams with an Exposure-Calibrated ion chamber V. Calibration of Photon Beams in Phantoms by the NBBI Method VI. Calibration of Electron Beams in Phantoms	6
4	INTEGRATING DOSIMETERS I. Thermoluminescence Dosimetry II. Photographic Dosimetry Ill. Chemical Dosimetry IV. Calorimetric Dosimetry	6
5	DOSIMETRY BY PULSE-MODE DETECTORS I. Introduction II. Geiger-Muller and Proportional Counters III. Scintillation Dosimetry IV. Semiconductor Detectors for Dosimetry	6
6	NEUTRON INTERACTIONS AND DOSIMETRY I. Introduction II. Neutron Kinetic Energy Ill. Neutron Interactions in Tissue IV. Neutron Sources V. Neutron Quality Factor VI. Calculation of the Absorbed Dose in a Cylindrical Phantom Representing the Human Body	3
...		
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		Medical Internal Radiation Dose.	
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Midterm's exam	All weeks	20 %
3	Lab.	8th week	20 %
4	Final Exam (theoretical)	13th 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-Radiation Physics for Medical Physicists 3rd ed Ervin B. Podgoršak Springer 2016 ISBN 978-3-319-25380-0 2-Introduction to radiological physics and radiation dosimetry Frank Herbert- Wiley 2004, ISBN-13: 978-0-471-01 146-0
Essential References Materials	3- Compendium to Radiation Physics for Medical Physicists: 300 Problems and Solutions Ervin B. Podgoršak Springer 2014 ISBN 978-3-319-25380-0
Electronic Materials	www.iomp.org www.aapm.org www.afomp.org/
Other Learning Materials	The following journals are recognized as official publications of the IOMP: 1. Physics in Medicine and Biology 2. Physiological Measurement 3. Medical Physics 4. Journal of Applied Clinical Medical Physics 5. Medical Physics International

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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NCAAA
T4
2020

Course Specifications

Course Title:	**Nuclear medicine physics (1)**
Course Code:	**PHYM3601-3**
Program:	**Medical physics**
Department:	**Physics**
College:	**College of applied science**
Institution:	**Umm Al-Qura University**

Table of Contents

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: Level 8 /3rd year	
4. Pre-requisites for this course (if any)**:** Medical Radiation 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	30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of radioisotopes used in medicine and operation of related equipment, such as formation of radionuclides, non-scintillation detectors, nonimaging scintillation detectors, imaging instrumentation, radioisotopes medical applications, nuclear medicine imaging and quality control. This course will provide a conceptual and experimental background in nuclear medicine physics sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

This course is designed to demonstrate and consolidate the physical principles of radioisotopes used in medicine and biology and operation of related equipment, lecture include;

1 Basic Nuclear Medicine Physics,
2 Formation of Radionuclides,
3 Nonscintillation Detectors,
4 Nonimaging Scintillation Detectors,

5 Imaging Instrumentation,
6 Radioisotopes medical applications
7 Nuclear medicine imaging
9 Quality Control
10 Radiation protection in nuclear medicine

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Apply the laws of Nuclear Medicine Physics.	K3
1.2	Outlines about natural background radiation and other sources.	K2
1.3	Solve problems by using suitable mathematical principles	K2
1...	Describe concepts, Procedures of some experiments in Nuclear Medicine Physics.	K1
2	State operational radiation quantities	K5
2.1	**Skills :**	
2.2	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.3	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2...	Solve problems by using suitable mathematical principles	S2
3		
3.1	**Values:**	
3.2	Appraise the cooperation through teamwork to make a decision.	V1
3.3	The student knows how to analyse obtained data and how to manage it.-	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Basic of Nuclear Medicine Physics,** FUNDAMENTAL CONCEPTS THE POWER OF NUCLEAR MEDICINE HISTORICAL OVERVIEW CURRENT PRACTICE OF NUCLEAR MEDICINE THE ROLE OF PHYSICS IN NUCLEAR MEDICINE	3
2	**Decay of Radioactivity** A. ACTIVITY B. EXPONENTIAL DECAY C. METHODS FOR DETERMINING DECAY FACTORS D. IMAGE-FRAME DECAY CORRECTIONS E. SPECIFIC ACTIVITY F. DECAY OF A MIXED RADIONUCLIDE SAMPLE G. PARENT-DAUGHTER DECAY	3
3	**Radionuclide and Radiopharmaceutical Production** A. REACTOR-PRODUCED RADIONUCLIDES B. ACCELERATOR-PRODUCED RADIONUCLIDES C. RADIONUCLIDE GENERATORS D. EQUATIONS FOR RADIONUCLIDE PRODUCTION E. RADIONUCLIDES FOR NUCLEAR MEDICINE F. RADIOPHARMACEUTICALS FOR CLINICAL APPLICATIONS	3

4	**Radiation Detectors** A. GAS-FILLED DETECTORS B. SEMICONDUCTOR DETECTORS C. SCINTILLATION DETECTORS	3
5	**Problems in Radiation Detection and Measurement** A. DETECTION EFFICIENCY B. PROBLEMS IN THE DETECTION AND MEASUREMENT OF β PARTICLES C. DEAD TIME D. QUALITY ASSURANCE FOR RADIATION MEASUREMENT SYSTEMS	3
6	**Pulse-Height Spectrometry** A. BASIC PRINCIPLES B. SPECTROMETRY WITH NaI(Tl) C. SPECTROMETRY WITH OTHER DETECTORS	3
7	**Counting Systems** A. NaI(Tl) WELL COUNTER B. COUNTING WITH CONVENTIONAL NaI (Tl) DETECTORS C. LIQUID SCINTILLATION COUNTERS	3
8	**The Gamma Camera: Basic Principles** A. GENERAL CONCEPTS OF RADIONUCLIDE IMAGING B. BASIC PRINCIPLES OF THE GAMMA CAMERA C. TYPES OF GAMMA CAMERAS AND THEIR CLINICAL USES	3
9	**The Gamma Camera: Performance Characteristics** A. BASIC PERFORMANCE CHARACTERISTICS B. DETECTOR LIMITATIONS: NONUNIFORMITY AND NONLINEARITY C. DESIGN AND PERFORMANCE CHARACTERISTICS OF PARALLEL-HOLE COLLIMATORS D. PERFORMANCE CHARACTERISTICS OF CONVERGING, DIVERGING, AND PINHOLE COLLIMATORS E. MEASUREMENTS OF GAMMA CAMERA PERFORMANCE	6
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		Medical Internal Radiation Dose.	
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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-Physics in Nuclear Medicine 4th Edition - Simon Cherry, James Sorenson, Michael Phelps eBook ISBN: 9781455733675 Hardcover ISBN: 9781416051985 2-Practical Nuclear Medicine Third Edition Peter F. Sharp Howard G. Springer ISBN: 978-1-85233-875-6
Essential References Materials	Rachel A. Powsner, Edward R. Powsner "Essential Nuclear Medicine Physics" Blackwell Publishing Ltd 2006
Electronic Materials	
Other Learning Materials	Journal of nuclear medicine technology; http://tech.snmjournals.org/ Journal of nuclear medicine ; http://jnm.snmjournals.org/

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	21/2/2022

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Education & Training Evaluation Commission

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2020

Course Specifications

Course Title:	Physics of Radiation Therapy (1)
Course Code:	PHYM3801-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 8 /3rd year								
4. Pre-requisites for this course (if any)**:** Medical Radiation 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	30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides the necessary practical and theoretical background for the support of a radiotherapy physics service within radiotherapy. The course provides the basis for understanding physical principles within radiotherapy, focusing on clinical application. Important topics are: Equipment for generating/delivering ionizing electron- and photon radiation, clinical radiation dosimetry, characteristics and specifications of radiation fields, treatment planning (volume definitions, field setup, fractionations, modern techniques and dose calculation algorithms), quality assurance, and possibilities and limitations related to treatment modalities like brachytherapy and particle therapy.

2. Course Main Objective

On completion of this course, students should be able to:

- Describe the basic principles underlying radiotherapy methods;
- Explain the principles of radiotherapy equipment;
- Define the characteristics of clinical beams and their measurement;

- Describe dosimetry measurements used in radiotherapy;
- Perform basic treatment planning in radiotherapy;
- Perform basic QC for equipment in radiotherapy;
- Describe the use of sealed and unsealed sources in radiotherapy;

Discuss a range of clinical applications.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	List the patient dose computation methods	K3
1.2	Outlines about natural background radiation and other sources.	K2
1.3	List the RDLs for conventional x-ray, CT, Mammogram	K2
1...	Describe calibration of thermoluminscence dosimeters	K1
2	State operational radiation quantities	K5
2.1	**Skills :**	
2.2	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.3	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2...	Integrate information technology (IT) based solution into radiation.	S2
3		
3.1	**Values:**	
3.2	Appraise the cooperation through teamwork to make a decision.	V1
3.3	The student knows how to analyse obtained data and how to manage it.-	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Radiation in the Treatment of Cancer** • Kilovoltage x-ray Units • Linear Accelerator • Cobalt Machines • Simulator	6
2	**Dose Distribution and Scatter analysis** • Phantoms • Depth Dose Distribution • Percentage Depth Dose • Tissue-Air Radio • Scatter-air Ratio	6
3	**Patient dose Computation Methods** • Acquisition of patient data • Treatment simulation • Source to axis distance and isocentric techniques	6
	A system of Dosimetric calculations • Dose calculation parameters (Monitor unit)	3

4	**Treatment Planning I:Isodose Distribution** • Isodose chart • Measurement of isodose curves.	3
5	**Treatment Planning: Patient data, Corrections, and set-up, Field Shaping, Skin dose** • parameters of isodose curves • Combination of radiation fields • Wedge field techniques • Tumor dose specification for external photon beams • Field shaping • Skin dose	6
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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-The Physics of Radiation Therapy- Faiz M. Khan, John P. Gibbons 2020 - 6th ed by Wolters 2-Walter and Miller's Textbook of Radiotherapy Radiation Physics, Therapy and Oncology 7th ed Edited by Paul Symonds 2012 Elsevier, ISBN 978 0 443 07486 8
Essential References Materials	
Electronic Materials	

Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

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Education & Training Evaluation Commission

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Course Specifications

Course Title:	Physics of medical imaging (1)
Course Code:	PHYM3701-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 7 /3rd year	
4. Pre-requisites for this course (if any)**:** Medical Radiation 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	30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course introduces the main methods of medical imaging, namely X-ray radiography, computed tomography (CT), mammography, and X ray fluoroscopy. It enables students to develop an understanding of the physics principles underlying these imaging techniques and an awareness of their clinical applications. It also discusses the mathematical principle involved in image formation and processing and provides experience in their use.

2. Course Main Objective

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

- Describe the physics principles underlying the operation of medical imaging equipment.
- List, in words, merits and drawbacks of each imaging modality.
- Demonstrate an understanding of and apply mathematical methods of image construction and processing
- Compare the different methods of image processing of different modalities.

- Demonstrate an understanding of aspects of clinical applications of imaging modalities;
- Interpret the images and state the artifacts of each imaging modality

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	List the requirements for each imaging modality	K1
1.2	Recognize the basic physical principles of different imaging modalities.	K3
1.3	Outline the merits and drawbacks of each imaging modality	K2
1...		
2	**Skills :**	
2.1	The ability Solve problems related to the mathematical principles of the imaging modality	S2
2.2	The ability to Analyze different artefacts of images of different imaging modalities	S1
2.3	The ability Compare between the properties of different imaging modes and their medical applications.	S1
2...		
3	**Values:**	
3.1	Evaluate image quality of different imaging modalities	V1
3.2	Choose the appropriate imaging modalities for selected clinical situations	V2
3.3	Interpret the difference in image quality of different imaging modes	V3
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction to Medical Imaging** 1The Modalities 2 Image Properties 3. Radiation 4. Attenuation of x-rays and Gamma Rays 5.Absorption of Energy from X-rays and Gamma Rays 6. Imparted Energy, Equivalent Dose, and Effective Dose	3
2	**Image Quality** 1 Spatial Resolution 2 Convolution 3 Physical Mechanisms of Blurring 4 The Frequency Domain 5 Contrast Resolution 6 Noise Texture: The Noise Power Spectrum 7 Contrast 8 Contrast-to-Noise Ratio 9 Signal-to-Noise Ratio 10 Contrast-Detail Diagrams	6

	11 Detective Quantum Efficiency 12 Receiver Operating Characteristic Curves	
3	**Medical Imaging Informatics** 1 Analog and Digital Representation of Data 2 Digital Radiological Images 3 Digital Computers 4 Information Storage Devices 5 Display of Digital Images 6 Computer Networks 7 PACS and Teleradiology 8 Image Processing	3
4	**Radiography** 1. X-ray Production, X-ray Tubes, and x-ray Generators 2. Geometry of Projection Radiography 3. Screen-Film Radiography 4. Computed Radiography 5. Radiographic Detectors, Patient Dose, and Exposure Index 6. Dual-Energy Radiography 7. Scattered Radiation in Projection Radiographic Imaging	3
5	**Mammography** 1 x-ray Tube and Beam Filtration 2 x-ray Generator and Phototimer System 3 Compression, Scattered Radiation, and Magnification 4 Screen-Film Cassettes and Film Processing 5 Digital Mammography 6 Radiation Dosimetry 7 Regulatory Requirements	3
6	**Fluoroscopy** 1 Functionality 2 Fluoroscopic Imaging Chain Components 3 Fluoroscopic Detector Systems 4 Automatic Exposure Rate Control 5 Fluoroscopy Modes of Operation 6 Image Quality in Fluoroscopy 7 Fluoroscopy Suites 8 Radiation Dose	3
7	**Computed Tomography** 1 Clinical Use 2 CT System Designs 3 Modes of CT Acquisition 4 CT Reconstruction 5 Image Quality in CT 6 CT Image Artifacts 7 CT Generations	3
8	**X-ray Dosimetry in Projection Imaging and Computed Tomography** 1 Attenuation of X-rays in Tissue 2 Dose-Related Metrics in Radiography and Fluoroscopy 3 Monte Carlo Dose Computation 4 Equivalent Dose 5 Organ Doses from X-ray Procedures 6 Effective Dose 385	6

	7 Absorbed Dose in Radiography and Fluoroscopy 8 CT Dosimetry and Organ Doses 9 Computation of Radiation Risk to the Generic Patient 10 Computation of Patient-Specific Radiation Risk Estimates 11 Diagnostic Reference Levels 12 Increasing Radiation Burden from Medical Imaging	
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 and Understanding**		
1.1	List the requirements for each imaging modality	1. Lectures 2. Tutorials 3. Individual Assignment Discussions	a) Solve some example during the lecture. b) Quizzes c) Short exams (mid-term exams) d) Long exams (final) e) Discussions during the lectures. f) Home work.
1.2	Recognize the basic physical principles of different imaging modalities.		
…	Outline the merits and drawbacks of each imaging modality		
2.0	**Skills :**		
2.1	The ability Solve problems related to the mathematical principles of the imaging modality	1. Analatyical problems in field 2. Individual and Group Assigments 3. Group Discussions	a) Aissgnments included some open end tasks b) Open ended tasks (Image analyzation) c) Image j application on some images of different modalities d) Homework e) Final exam
2.2	The ability to Analyze different artefacts of images of different imaging modalities		
…	The ability Compare between the properties of different imaging modes and their medical applications.		
3.0	**Values:**		
3.1	Evaluate image quality of different imaging modalities	1. Writing an essay 2. Presentations in some selected topics 3. Small Group Discussion. Visits to Hospitals to Improve Students' Expert in Field	a) Essay (Group Assessment) b) Presentations (individual and Group Assessment) c) Homework d) Final exam Report in field (Individual Assessment)
3.2	Choose the appropriate imaging modalities for selected clinical situations		
…	Interpret the difference in image quality of different imaging modes		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score

1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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-The Essential Physics of Medical Imaging 3rd ed. JERROLD T. BUSHBERG 2012 by LIPPINCOTT WILLIAMS ISBN 978-0-7817-8057-5 2- William R. Hendee and Russell E. Ritenour "Medical Imaging Physics" 4th Eds. Wiely-Liss. 2002. (Electronic + Hard Copies)
Essential References Materials	1-Paul Suetens. “Fundamentals of Medical Imaging”, 2nd Ed., Cambridge University Press, 2009. 2- Farr’s Physics for Medical Imaging 2nd ed. Penelope Allisy- Roberts Elsevier Limited 2008 ISBN: 978-0-7020-2844-1
Electronic Materials	• http://www.diagnosticimaging.com/ • http://www.who.int/diagnostic_imaging/en/ • https://imagej.nih.gov/ij/ • https://www.iaea.org/newscenter/multimedia/videos/safe-medical-imaging-for-children • https://www.iaea.org/topics/diagnosis-of-diseases • https://www.radiologyinfo.org/en/submenu.cfm?pg=test-treatment
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart Board

Item	Resources
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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	Physics of medical ultrasound
Course Code:	PHYM3703-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 7 /3rd year	
4. Pre-requisites for this course (if any)**:** Fundamentals of Electronics	
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	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course are to tease out the ultrasound wave properties from our everyday experience by specific examples of how ultrasound waves used in medical application especially imaging. The overall goal is to study the physical characteristics of ultrasound, generation methods and different medical applications as a safe medical imaging technique.

2. Course Main Objective

This course aims to provide students with foundation understanding of wave motion and the properties of different types of waves with major applications and propagation of sound waves. Topics include basic properties of waves, transverse and longitudinal waves, dispersion, Doppler effect, properties of sound, interference. This course aims to provide an account of the phenomenon of wave propagation and the properties of the wave equation in general, in a form which can be applied to a range of physical phenomena.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Learn fundamentals of ultrasound and wave physics.	K1
1.2	Understand the design of ultrasonic transducer and their applications mentioned	K3
1.3	To use mathematical formulation to describe the physical principle of different imaging	K3
1.4	Improve logical thinking.	
2	**Skills :**	
2.1	Summarize the different types of ultrasound imaging transducer and modes.	S2
2.2	Analyze the physical meaning of the obtained ultrasonic images.	S1
2.3	Justify a short report in a written form and/or orally using appropriate scientific language.	S3
2...		
3	**Values:**	
3.1	Appraise the cooperation through teamwork to assess and criticize various emergent problems.	V2
3.2	- Illustrate information technology and modern computer tools to locate and retrieve scientific information.	V1
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Ultrasonics:** 1 Introduction 2 Brief Early History 3 Underwater Sound (SONAR) 4 Medical and Biological Ultrasonics 5 Industrial Ultrasonics 6 Nondestructive Testing/Evaluation 7 Ultrasonics in Electronics 8 Physical Acoustics 9 Ultrasonic Systems: Transmitters and Receivers 10 Low-Intensity Applications 11 High-Intensity Applications	6
2	**Elastic Wave Propagation and Associated Phenomena** 1 Introduction 2 Power Delivered to an Oscillating System 3 Velocity of Sound 4 Impingment of an Ultrasonic Wave on a Boundary 5 Transmission through Thin Plates 6 Diffraction 7 Standing Waves 8 Doppler Effect	6

	9 Superposition of Waves 10 Attenuation of an Ultrasonic Wave 11 Relaxation 12 High-Power Phenomena	
3	**Fundamental Equations Employed in Ultrasonic** 1 Introduction 2 Simple Spring–Mass Oscillator 3 Wave Equations 4 Solution of the Plane-Wave Equation, Linear System 5 Transverse-Wave Equation 6 Solution of the Transverse-Wave Equation 7 Plate Waves	3
4	**Basic of Ultrasonic Transducers** 1 Introduction 2 Equivalent Circuits 3 Piezoelectric Transducers 4 Magnetostrictive Transducers 5 Electromagnetic Devices 6 Pneumatic Devices.	3
5	**Ultrasound in medical Diagnosis** 1 Introduction 2 Power Measurements and Dosages 3 Effect on Human Blood 4 Effect on Tissue Regeneration 5 Equipment 6 Ultrasonic Contrast Agents 7 Diagnosis by Reflection Methods 8 Diagnosis by Doppler Methods	3
6	**Applications of High-Intensity Ultrasonics:** 1 Introduction 2 Mechanical Effects 3 Chemical Effects: Sonochemistry 4 Metallurgical Effects	3
7	**Ultrasound in medical Therapy** 1 Equipment 2 Physical Therapy 3 Rheumatic and Related Disorders 4 Sonicated Drug Delivery 5 Phonophoresis 6 Diffusion of Subcutaneous Injections 7 Ophthalmic Therapy 8 Effects on Paced Hearts	3
8	**Ultrasound in Surgery** 1 Equipment 2 High-Intensity Focused Ultrasound Hyperthermia 3 Cancer 4 Neurosonic Surgery 5 Tissue Dissection and Ablation 6 Phacoemulsification 7 Ultrasonic-Assisted Lipoplasty 8 Ultrasound in Dentistry	3

	9 High-Frequency Imaging/Acoustic Microscopy	
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
			in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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-Ultrasonics Fundamentals, Technologies, and Applications 3rd ed. Dale Ensminger 2012 by Taylor & Francis Group, ISBN 13: 978-1-4200-2027-4 2-Diagnostic Ultrasound Imaging and Blood Flow Measurements K. Kirk Shung 2006 by Taylor & Francis Group ISBN -10: 0-8247-4096-3
Essential References Materials	1-Medical Imaging Physics, 4th Ed, William R. Hendee, E. Russell Ritenour, Wiley-Liss, Inc., 2002. 2- Fundamentals of Ultrasonographic techniques by J. D. Wicks and K. S. Howe.
Electronic Materials	https://www.sciencedirect.com/journal/ultrasonic-imaging http://www.physicsclassroom.com http://www.brooksidepress.org/Products/Military_OBGYN/Ultrasound/basic_ultrasound.htm.
Other Learning Materials	The Matlab and Image J software package to train the student about how making image processing.

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart Board
Other Resources	

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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

Field Experience Specifications

Course Title:	Co-op Field Experience in Medical Physics
Course Code:	PHYM3903 -8
Program:	Medical Physics
Department:	Physics
College:	Applied Science
Institution:	Umm Al-Qura University

Table of Contents

A. Field Experience Identification

1. Credit hours: 8 hours
2. Level/year at which this course is offered: after level 9
3. Dates and time allocation of field experience activities. • Number of weeks: (10) week • Number of days: (50) day • Number of hours: (300) hour
4. Pre-requisites to join field experience (if any)**:** Approvement of Physics Department

B. Learning Outcomes, and Training and Assessment Methods

1. Field Experience Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	List the stages of the field training	K1
1.2	Describe each stage using mathematics	K2
1.3		
1...		
2	**Skills:**	
2.1	Apply Physics law to calculate the physical quantity	S1
2.2	Explain the scientific theoretical and empirical procedures in physics	S2
2.3		
3	**Values:**	
3.1	Apply standards of integrity and ethics in all tasks	V1
3.2	Collaborate and contribute responsibly and effectively in teamwork	V2
3.3		
3...		

2.Alignment of Learning Outcomes with Training Activities and Assessment Methods

Code	Learning Outcomes	Training Methods/Activities	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	List the stages of the field training		Progress report, Final presentation
1.2	Describe each stage using mathematics		
…			
2.0	**Skills**		
2.1	Apply Physics law to calculate the physical quantity		Final report, The faculty advisor's evaluation, Evaluation of field-experience committee
2.2	Explain the scientific theoretical and empirical procedures in physics		
…			
3.0	**Values**		
3.1	Apply standards of integrity and ethics in all tasks		Progress report, Final report,

Code	Learning Outcomes	Training Methods/Activities	Assessment Methods
3.2	Collaborate and contribute responsibly and effectively in teamwork		Final presentation The faculty advisor's evaluation, Evaluation of field-experience committee
…			

3. Field Experience Learning Outcomes Assessment

a. Students Assessment Timetable

#	Assessment task*	Assessment timing (Week)	Percentage of Total Assessment Score
1	Attendance and punctuality at the field location.	Weekly	10%
2	Preparing the plan or a proposal of work.	First week	4%
3	Dependability and reliability, ability for self-learning and search for information.	Weekly	10%
4	Maintaining effective relationships with co-workers.	Weekly	10%
5	Writing a weekly report on his progress.	Weekly	10%
6	Quality of work output.	Weekly	16%
7	Final report.	Final week	20%
8	Final Presentation and/or poster presentation.	Final week	20%
	Total		100%

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

b. Assessment Responsibilities

م	Category	Assessment Responsibility
1	**Teaching Staff**	Attendance and punctuality at the field location. Preparing the plan or a proposal of work. Dependability and reliability, ability for self-learning and search for information. Maintaining effective relationships with co-workers. Writing a weekly report on his progress. Quality of work output. Final report. Final Presentation and/or poster presentation.
2	**Field Supervisor**	Attendance and punctuality at the field location. Preparing the plan or a proposal of work. Dependability and reliability, ability for self-learning and search for information. Maintaining effective relationships with co-workers. Writing a weekly report on his progress. Quality of work output. Final report. Final Presentation and/or poster presentation.
3	**Others** (Field Experience committee)	Final report. Final Presentation and/or poster presentation.

C. Field Experience Administration

1. Field Experience Locations

a. Field Experience Locations Requirements

Suggested Field Experience Locations	General Requirements*	Special Requirements**
Saudi Standards and Metrology Organization in Jeddah	Approvement of Physics Department	Acceptance from Field experience locations.
King Abdulaziz University – Nanotechnology center		
Modern Technology Laboratories Corporation Laboratory		
Saudi Aramco		
The Central Laboratory of the Faculty of Science at any university		
The Central Laboratory of the Faculty of Science at UQU		
Water desalination company		
Saudi Electricity Company		
Factories or companies related to the field.		
Radiation centers		
Research Lab within the department		
Hospitals		

*Ex: provides information technology ,equipment ,laboratories ,halls ,housing ,learning sources ,clinics etc.

**Ex: Criteria of the training institution or related to the specialization, such as: safety standards, dealing with patients in medical specialties, etc.

b. Decision-making procedures for identifying appropriate locations for field experience

1. After preparing an integrated plan for the field experience by the Field Experience Committee, the head of the department displays the topics of field experience and its location for students to choose what suits them best.
2. Then the students apply to choose one of the displayed field experiences.
3. Finally, the supervisor provides the student with guidelines about what kinds of tasks the student is supposed to practice at the field location.

2. Supervisory Staff

a. Selection of Supervisory Staff

Selection Items	Field Supervisor	Teaching Staff
Qualifications	Highly qualified field member	Faculty staff
Selection Criteria	10 years' experience	PhD

b. Qualification and Training of Supervisory Staff

(Including the procedures and activities used to qualify and train the supervisory staff on supervising operations, implementing training activities, the follow-up and evaluation of students, etc.)

3. Responsibilities

a. Field Experience Flowchart for Responsibility

including units, departments, and committees responsible for field experience, as evidenced by the relations between them.

1. The Field Experience Committee prepares an integrated plan on field experience based on questionnaires for faculty, students and other institutions, and submits it to the department head.

2. The head of the department displays the topics of field experience and its Institute for students to choose what suits them best.
3. The students apply to choose one of the displayed field experiences.
4. The supervisor (a faculty staff member) should provide the student with guidelines about what kinds of tasks the student is supposed to practice at the field location.
5. The Field Placement Agreements serve as a contract between the University and training organization. These agreements are negotiated annually and must be approved by the Dean of the Applied Science and each organization Superintendent.
6. The students work for 16 weeks (1 day a week, and 5 hours a day) during normal semester, and 8 weeks (2 days a week, and 5 hours a day) during summer semester in the experience field location.
7. The field supervisor, is responsible for guiding and assigning tasks to the student as well as reporting the student's progress to the supervisor in the Physics department, and both are responsible for 60% of the Total Assessment Score given in table 3-a (items 1-6).
8. Finally, the student should give a final report and a presentation about his progress in front of the Field Experience Committee (60% of the Total Assessment Score given in table 3-a (items 7-8).

b. Distribution of Responsibilities for Field Experience Activities

Activity	Department or College	Teaching Staff	Student	Training Organization	Field Supervisor
Selection of a field experience site	ü		ü	ü	
Selection of supervisory staff	ü		ü		
Provision of the required equipment	ü			ü	
Provision of learning resources	ü			ü	
Ensuring the safety of the site	ü	ü	ü	ü	ü
Commuting to and from the field experience site			ü		
Provision of support and guidance		ü			ü
Implementation of training activities (duties, reports, projects, ...)			ü		
Follow up on student training activities		ü			ü
Adjusting attendance and leave		ü			ü
Assessment of learning outcomes	ü	ü	ü	ü	ü

Activity	Department or College	Teaching Staff	Student	Training Organization	Field Supervisor
Evaluating the quality of field experience	ü	ü	ü	ü	ü
Others (specify)					

4. Field Experience Implementation

a. Supervision and Follow-up Mechanism

1. The student fills the form of the field experience to choose the suited field.
2. The site visit should be done by the faculty advisor to collect students' feedback regularly, if they are trained outside the campus.
3. Students should prepare Data logbook for daily records.
4. Students are expected to give a short report every week to the supervisor.
5. Students are expected to evaluate their field training efficiency, supervisor's performance, and all their feedback related to field-work training for improvement purposes to detect the strength and weak points during the training (using a suitable questionnaire)
6. Quality Assurance Committee analyses all questionnaires results and files a full detailed report and provide the department council with the suggested modification.
7. Proper actions based on the suggested modifications and recommendations will be taken by the department management and faculty deanship to improve the performance and overcome the challenges facing the field training course practice.

b. Student Support and Guidance Activities

1. All fields of training should be displayed to the students, to choose the suitable field training.
2. Supervising faculty remains in constant touch with students and his field supervisor.
3. The results and recommendations from the supervisors in the training field about the evaluation of the students (their work technically and their exams and reports and presentations) are submitted to the department and then students take corrective measures in presentation and writing skills.
4. Students report back to the faculty supervisor for any problem arises during the training.
5. Students submit a progress report every week to the academic supervisor by email.

5. Safety and Risk Management

Potential Risks	Safety Actions	Risk Management Procedures
The expulsion of trainee without compelling reasons	Sign Memorandum of Understanding (MoU) with the Field experience institute for providing training to the students.	Select Field experience institute with an agreement in advance.
Injury to the trainee during Field training	Insure for any physical injury suffered by the trainee during the training period.	Select Field experience institute with an agreement in advance.
Claim for financial reimbursements from the college against any expenditure for the	Contract an agreement with the Field experience institute.	Select Field experience institute with an agreement in advance.

completion of training program.		

G. Training Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Training of trainee.	Student Faculty supervisor Field supervisor Field experience committee	Questionnaire. Reports.
Faculty supervision	Student Faculty supervisor Field supervisor Field experience committee	Questionnaire. Reports.
Field supervision	Student Faculty supervisor Field supervisor Field experience committee	Questionnaire. Reports.

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

E. Specification Approval Data

Council / Committee	
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
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2020

Course Specifications

Course Title:	**Computational Medical Physics (1)**
Course Code:	**PHYM4901-4**
Program:	**Medical Physics**
Department:	**Physics**
College:	**College of applied science**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours:							
2. Course type							
a.	University	☐	College ☐	Department	X	Others	☐
b.	Required	X	Elective ☐				
3. Level/year at which this course is offered:							
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**	4	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	36
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify) Exams & quizzes	4
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Computational Medical Physics is designed to cover techniques used in modeling Medical physical systems numerically and analyzing data. It is designed to help the students gain experience with programming languages in carrying out this work. It is also important to know how these programming languages are accessed in an operating system. Computer software is used for diagnosis of diseases. It can be used for the examination of internal organs of the body. Advanced computer-based systems are used to examine delicate organs of the body. Some of the complex surgeries can be performed with the aid of computers. Medical imaging is a vast field that deals with the techniques to create images of the human body for medical purposes. Many of the modern methods of scanning and imaging are largely based on the computer technology.

2. Course Main Objective
- The E-Learning system is being conducted. - Students should learn a programming language (e.g. Matlab package, visual C++, ….etc). - To carry out an assay, encourage the students to use different web search engines, writing software packages, statistical software....etc. - Interpersonal skills, relating to the ability to interact with other people and to engage in team-working through group discussion. - Problem solving skills, relating to qualitative and quantitative information.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the basic knowledge of computer related to the medical signal and/or image processing.	K1
1.2	Outline the basic information & communication technologies (ICT) related to medicine.	K3
1.3	State various image quality enhancement techniques.	K3
1...	Recognize how to improve and develop the medical signal and /or image related to essential different medical imaging (e.g. nuclear medicine, MRI, ophthalmic and US image processing	K2
2	**Skills :**	
2.1	Summarize general areas of image processing.	S2
2.2	Compare between low pass filter and high pass filter.	S1
2.3	Differentiate between Clipping, Point Operations and Look-Up Table (LUT).	S2
2...	Design different codes using a programming language to locate and enhance the medical signal and/or image.	S3
3	**Values:**	
3.1	Illustrate information technology and modern computer tools to locate and retrieve scientific information relevant to computing in medicine.	V1
3.2	Appraise the cooperation through teamwork to assess and criticize various emergent problems.	V2
3.3	Interpret the defined noise and artifacts an in the medical images to be improved using different signal and/or image processing package.	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Matlab: -Variables and assignment statements -Numerical expressions -Characters and strings -Relational expressions -Random numbers -Built-in functions	8
2	Vectors and Matrices -Creating vectors -Creating matrix -Dimensions	8

3	Matlab Programming: -Algorithms -Matlab scripts -Input and Output -Writing and reading -User-defined functions	8
4	Selection statements: -The if statement -The if-else statement -The nested if-else statement -The elseif clause -The switch statement	8
5	Applications	4
Total		**36**

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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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- A Practical Introduction to Programming and Problem Solving, 5th edition. Stormy Attaway. Elsevier 2018. ISBN: 978-0-12815-479-3.
Essential References Materials	1- An Introduction to Programming and Numerical Methods in MATLAB. Steve Otto and James Denier. Springer 2005 ISBN: 978-1-85233-919-7.
Electronic Materials	https://uk.mathworks.com/help/matlab/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart Board, , 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	**Nuclear medicine physics (2)**
Course Code:	**PHYM4602-4**
Program:	**Medical physics**
Department:	**Physics**
College:	**College of applied science**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours: 4 (3+1)	
2. Course type **a.** University ☐ College ☐ Department ☑ Others ☐ **b.** Required ☑ Elective ☐	
3. Level/year at which this course is offered: Level 10 /4th year	
4. Pre-requisites for this course (if any): Nuclear medicine physics (1)	
5. Co-requisites for this course (if any): Nuclear medicine physics (2) lab	

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	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	30
3	Tutorial	
4	Others (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description

The course will cover the principle of radioisotopes used in medicine and operation of related equipment, such as formation of radionuclides, non-scintillation detectors, nonimaging scintillation detectors, imaging instrumentation, radioisotopes medical applications, nuclear medicine imaging and quality control. This course will provide a conceptual and experimental background in nuclear medicine physics sufficient to enable students to take courses that are more advanced in related fields.

2. Course Main Objective

This course is designed to demonstrate and consolidate the physical principles of radioisotopes used in medicine and biology and operation of related equipment, lecture include;

1 Basic Nuclear Medicine Physics,
2 Formation of Radionuclides,
3 Nonscintillation Detectors,
4 Nonimaging Scintillation Detectors,

5 Imaging Instrumentation,
6 Radioisotopes medical applications
7 Nuclear medicine imaging
9 Quality Control
10 Radiation protection in nuclear medicine

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Apply the laws of Nuclear Medicine Physics.	K3
1.2	Outlines about natural background radiation and other sources.	K2
1.3	Solve problems by using suitable mathematical principles	K2
1...	Describe concepts, Procedures of some experiments in Nuclear Medicine Physics.	K1
2	State operational radiation quantities	K5
2.1	**Skills :**	
2.2	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.3	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2...	Solve problems by using suitable mathematical principles	S2
3		
3.1	**Values:**	
3.2	Appraise the cooperation through teamwork to make a decision.	V1
3.3	The student knows how to analyse obtained data and how to manage it.-	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Image Quality in Nuclear Medicine** A. BASIC METHODS FOR CHARACTERIZING AND EVALUATING IMAGE QUALITY B. SPATIAL RESOLUTION C. CONTRAST D. NOISE E. OBSERVER PERFORMANCE STUDIES	3
2	**Tomographic Reconstruction in Nuclear Medicine** A. GENERAL CONCEPTS, NOTATION, AND TERMINOLOGY B. BACKPROJECTION AND FOURIER-BASED TECHNIQUES C. IMAGE QUALITY IN FOURIER TRANSFORM AND FILTERED BACKPROJECTION TECHNIQUES D. ITERATIVE RECONSTRUCTION ALGORITHMS E. RECONSTRUCTION OF FAN-BEAM, CONE-BEAM AND PINHOLE SPECT DATA, AND 3-D PET DATA	6
3	**Single Photon Emission Computed Tomography** A. SPECT SYSTEMS B. PRACTICAL IMPLEMENTATION OF SPECT C. PERFORMANCE CHARACTERISTICS OF SPECT SYSTEMS D. APPLICATIONS OF SPECT	3
4	**Positron Emission Tomography** A.BASIC PRINCIPLES OF PET IMAGING B. PET DETECTOR AND SCANNER DESIGNS	6

	C. DATA ACQUISITION FOR PET D. DATA CORRECTIONS AND QUANTITATIVE ASPECTS OF PET E. PERFORMANCE CHARACTERISTICS OF PET SYSTEM F. CLINICAL AND RESEARCH APPLICATIONS OF PET	
5	**Hybrid Imaging: SPECT/CT and PET/CT** A. MOTIVATION FOR HYBRID SYSTEMS B. X-RAY COMPUTED TOMOGRAPHY C. SPECT/CT SYSTEMS D. PET/CT E. ATTENUATION AND SCATTER CORRECTION USING CT F. HYBRID PET/MRI AND SPECT/MRI	3
6	**Digital Image Processing in Nuclear Medicine** A. DIGITAL IMAGES B. DIGITAL IMAGE-PROCESSING TECHNIQUES C. PROCESSING ENVIRONMENT	3
7	**Tracer Kinetic Modeling** A. BASIC CONCEPTS B. TRACERS AND COMPARTMENTS C. TRACER DELIVERY AND TRANSPORT D. FORMULATION OF A COMPARTMENTAL MODEL E. EXAMPLES OF DYNAMIC IMAGING AND TRACER KINETIC	3
8	**Radiation Safety and Health Physics** A. QUANTITIES AND UNITS B. REGULATIONS PERTAINING TO THE USE OF RADIONUCLIDES C. SAFE HANDLING OF RADIOACTIVE MATERIALS D. DISPOSAL OF RADIOACTIVE WASTE E. RADIATION MONITORING	3
...		
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
			these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8^{th} week	30 %
4	Final Exam (theoretical)	13^{th} 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-Physics in Nuclear Medicine 4th Edition - Simon Cherry, James Sorenson, Michael Phelps eBook ISBN: 9781455733675

Essential References Materials	Hardcover ISBN: 9781416051985
Electronic Materials	2-Practical Nuclear Medicine Third Edition Peter F. Sharp Howard G. Springer ISBN: 978-1-85233-875-6
Other Learning Materials	Rachel A. Powsner, Edward R. Powsner "Essential Nuclear Medicine Physics" Blackwell Publishing Ltd 2006

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

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NCAAA
T4
2020

Course Specifications

Course Title:	Physics of Medical imaging (2)
Course Code:	PHYM4702-4
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

A. Course Identification

1. Credit hours: 5 (4+1)	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: Level 10 /4th year	
4. Pre-requisites for this course (if any)**:** Physics of Medical Imaging (1)	
5. Co-requisites for this course (if any)**:** Physics of Medical Imaging (2) lab.	

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	40	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	40
2	Laboratory/Studio	40
3	Tutorial	
4	Others (specify)	
	Total	70

B. Course Objectives and Learning Outcomes

1. Course Description

This course introduces the main methods of medical imaging, namely X-ray radiography, computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET) and single photon emission computed tomography (SPECT). It enables students to develop an understanding of the physics principles underlying these imaging techniques and an awareness of their clinical applications. It also discusses the mathematical principle involved in image formation and processing and provides experience in their use.

2. Course Main Objective

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

- Describe the physics principles underlying the operation of medical imaging equipment.
- List, in words, merits and drawbacks of each imaging modality.
- Demonstrate an understanding of and apply mathematical methods of image construction and processing

- Compare the different methods of image processing of different modalities.
- Demonstrate an understanding of aspects of clinical applications of imaging modalities;
- Interpret the images and state the artifacts of each imaging modality

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	List the requirements for each imaging modality	K1
1.2	Recognize the basic physical principles of different imaging modalities.	K3
1.3	Outline the merits and drawbacks of each imaging modality	K2
1...		
2	**Skills :**	
2.1	The ability Solve problems related to the mathematical principles of the imaging modality	S2
2.2	The ability to Analyze different artefacts of images of different imaging modalities	S1
2.3	The ability Compare between the properties of different imaging modes and their medical applications.	S1
2...		
3	**Values:**	
3.1	Evaluate image quality of different imaging modalities	V1
3.2	Choose the appropriate imaging modalities for selected clinical situations	V2
3.3	Interpret the difference in image quality of different imaging modes	V3
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Magnetic Resonance Basics:** 1 Magnetism, Magnetic Fields, and Magnets 2 The Magnetic Resonance Signal 3 Magnetization Properties of Tissues 4 Basic Acquisition Parameters 5 Basic Pulse Sequences 6 MR Signal Localization 7 “K-Space” Data Acquisition and Image Reconstruction	8
2	**Magnetic Resonance Imaging: Advanced Image Acquisition Bioeffects, and Safety** 1 Image Acquisition Time 2 MR Image Characteristics 3 Signal from Flow 3 Perfusion and Diffusion Contrast Imaging 4 Magnetization Transfer Contrast 5 MR Artifacts 6 Magnetic Resonance Spectroscopy 7 Ancillary Components	8

	8 MR Bioeffects and Safety	
3	**Ultrasound** 1 Characteristics of Sound 2 Interactions of Ultrasound with Matter 3 Ultrasound Transducers 4 Ultrasound Beam Properties 5 Image Data Acquisition 6 Two-Dimensional Image Display and Storage 7 Doppler Ultrasound 8 Miscellaneous Ultrasound Capabilities 9 Ultrasound Image Quality and Artifacts 10 Ultrasound System Performance and Quality Assurance 11 Acoustic Power and Bioeffects	8
4	**Nuclear Imaging** 1-The Scintillation Camera 2- Planar Nuclear Imaging: The Anger Scintillation Camera 675 3- Computers in Nuclear Imaging	4
5	**Nuclear Imaging Emission Tomography** 1 Focal Plane Tomography in Nuclear Medicine 2 Single Photon Emission Computed Tomography 3 Positron Emission Tomography 4 Dual Modality Imaging—SPECT/CT	4
6	**PET Scanning Systems** Background Solid Scintillation Detectors in PET Photomultiplier Tube Pulse Height Analyzer Arrangement of Detectors PET Scanners Hybrid Scintillation Cameras PET/CT Scanners Small Animal PET Scanner Mobile PET or PET/CT	8
...		
Total		40

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 and Understanding**		
1.1	List the requirements for each imaging modality	1. Lectures 2. Tutorials 3. Individual Assignment Discussions	a) Solve some example during the lecture. b) Quizzes c) Short exams (mid-term exams) d) Long exams (final) e) Discussions during the lectures. f) Home work.
1.2	Recognize the basic physical principles of different imaging modalities.		
…	Outline the merits and drawbacks of each imaging modality		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
2.0	**Skills :**		
2.1	The ability Solve problems related to the mathematical principles of the imaging modality	1. Analatyical problems in field 2. Individual and Group Assigments 3. Group Discussions	a) Aissgnments included some open end tasks b) Open ended tasks (Image analyzation) c) Image j application on some images of different modalities d) Homework e) Final exam
2.2	The ability to Analyze different artefacts of images of different imaging modalities		
…	The ability Compare between the properties of different imaging modes and their medical applications.		
3.0	**Values:**		
3.1	Evaluate image quality of different imaging modalities	1. Writing an essay 2. Presentations in some selected topics 3. Small Group Discussion. Visits to Hospitals to Improve Students' Expert in Field	a) Essay (Group Assessment) b) Presentations (individual and Group Assessment) c) Homework d) Final exam Report in field (Individual Assessment)
3.2	Choose the appropriate imaging modalities for selected clinical situations		
…	Interpret the difference in image quality of different imaging modes		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Homework	All weeks	10 %
2	Midterm's exam	All weeks	20 %
3	Lab.	8th week	20 %
4	Final Exam (theoretical)	13th 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-The Essential Physics of Medical Imaging 3rd ed. JERROLD T. BUSHBERG 2012 by LIPPINCOTT WILLIAMS ISBN 978-0-7817-8057-5 2- William R. Hendee and Russell E. Ritenour "Medical Imaging Physics" 4th Eds. Wiely-Liss. 2002. (Electronic + Hard Copies)

Essential References Materials	1-Paul Suetens. "Fundamentals of Medical Imaging", 2nd Ed., Cambridge University Press, 2009. 2- Farr's Physics for Medical Imaging 2nd ed. Penelope Allisy- Roberts Elsevier Limited 2008 ISBN: 978-0-7020-2844-1
Electronic Materials	• http://www.diagnosticimaging.com/ • http://www.who.int/diagnostic_imaging/en/ • https://imagej.nih.gov/ij/ • https://www.iaea.org/newscenter/multimedia/videos/safe-medical-imaging-for-children • https://www.iaea.org/topics/diagnosis-of-diseases • https://www.radiologyinfo.org/en/submenu.cfm?pg=test-treatment
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	Physics of Radiation Therapy (2)
Course Code:	PHYM4802-4
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

A. Course Identification

1. Credit hours: 4 (3+1) **3**	
2. Course type	
a. University ☐ College ☐ Department ☒ Others ☐	
b. Required ☒ Elective ☐	
3. Level/year at which this course is offered: Level 10 /4th year	
4. Pre-requisites for this course (if any)**:** Physics of Radiation therapy (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	30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides the necessary practical and theoretical background for the support of a radiotherapy physics service within radiotherapy. The course provides the basis for understanding physical principles within radiotherapy, focusing on clinical application. Important topics are: Equipment for generating/delivering ionizing electron- and photon radiation, clinical radiation dosimetry, characteristics and specifications of radiation fields, treatment planning (volume definitions, field setup, fractionations, modern techniques and dose calculation algorithms), quality assurance, and possibilities and limitations related to treatment modalities.

2. Course Main Objective

On completion of this course, students should be able to:

- Describe the basic principles underlying radiotherapy methods;
- Explain the principles of radiotherapy equipment;

- Define the characteristics of clinical beams and their measurement;
- Describe dosimetry measurements used in radiotherapy;
- Perform basic treatment planning in radiotherapy;
- Perform basic QC for equipment in radiotherapy;
- Describe the use of sealed and unsealed sources in radiotherapy;

Discuss a range of clinical applications.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1		
1.2	Outlines about natural background radiation and other sources.	K2
1.3	List the RDLs for conventional x-ray, CT, Mammogram	K2
1...	Describe calibration of thermoluminscence dosimeters	K1
2	State operational radiation quantities	K5
2.1	**Skills :**	
2.2	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.3	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2...	Integrate information technology (IT) based solution into radiation.	S2
3		
3.1	**Values:**	
3.2	Appraise the cooperation through teamwork to make a decision.	V1
3.3	The student knows how to analyse obtained data and how to manage it.-	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Dosimetry in Radiotherapy** • **Cavity ionization chambers** ❖ **ionization chambers corrections for reading** ❖ **Absorbed dose to water based codes (TG-51 & TRS-398)**	6
2	**Modern radiation therapy** • **Three-Dimensional Conformal Radiation Therapy** • **Intensity-Modulated Radiation Therapy** • **Volume Modulated Arc Therapy(VMAT)** • **Stereotactic Body Radiation Therapy** • **Image-Guided Radiation Therapy** • **Tomotherapy** • **Adaptive radiotherapy** • **Proton Beam Therapy**	6
3	**Electron beam Therapy.** • **Electron interactions** • **Determination of absorbed dose** • **Characteristics of clinical electron beams**	6

	• Field shaping	
4	Patient treatment verification • Position verification • Dose verification (pretreatment, in vivo verification)	6
5	Quality Assurance Acceptance Tests and Commissioning Measurements Daily, Monty, annually tests	3
6	Radiation Protection and Safety in Radiotherapy Safety in the design of facilities	3
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
			Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8^{th} week	30 %
4	Final Exam (theoretical)	13^{th} 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-The Physics of Radiation Therapy- Faiz M. Khan, John P. Gibbons 2020 - 6^{th} ed by Wolters 2-Walter and Miller's Textbook of Radiotherapy Radiation Physics, Therapy and Oncology 7th ed Edited by Paul Symonds 2012 Elsevier, ISBN 978 0 443 07486 8
Essential References Materials	
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	Biomechanics
Course Code:	PHYM4401-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 5 /2nd year	
4. Pre-requisites for this course (if any)**:** Medical physics	
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	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

In this course the principles of classical mechanics are applied to the study of human motion to provide students with an understanding of the internal and external forces acting on the body during human movement. The role of muscle in generating force and controlling movement is emphasized. Students participate in a team project to compare the biomechanics of two motions by collecting and analyzing motion data.

2. Course Main Objective

After completing this course, students will be able to describe motions of the body during typical activities, predict which muscles are responsible for controlling movement, quantify the forces acting on the body during movement, understand the limitations of different experimental and analytical techniques used to quantify human movement, interpret motion data accurately, and evaluate studies of human movement. Students will also learn the computer skills necessary to perform a biomechanical analysis of human movement.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	- Define the basic knowledge of the biomechanics and the related laws	K1
1.2	Outline different application of biomechanics and the application on the human body movement.	K3
1.3	Summarize general areas of human movement and their applications	K1
1...		
2	**Skills :**	
2.1	Work effectively in groups as well as individuals.	S1
2.2	Justify a short report in a written form and/or orally using appropriate scientific language.	S2
2.3		
2...		
3	**Values:**	
3.1	- Illustrate information technology and modern computer tools to locate and retrieve scientific information relevant to computing in medicine.	V1
3.2	Appraise the cooperation through teamwork to assess and criticize various emergent problems.	V3
3.3	Interpret the defined noise and artifacts an in the medical images to be improved using different signal and/or image processing package.	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Introduction** What Is Biomechanics? Biomechanics: Definition and Perspective What Problems Are Studied by Biomechanists? Why Study Biomechanics? Problem-Solving Approach Quantitative versus Qualitative Problems Solving Qualitative Problems Formal versus Informal Problems Solving Formal Quantitative Problems Units of Measurement	3
2	**Kinematic Concepts for Analyzing Human Motion** Forms of Motion, Linear Motion, Angular Motion, General Motion Mechanical Systems Anatomical Reference Position Directional Terms Anatomical Reference Planes Anatomical Reference Axes Joint Movement Terminology Spatial Reference Systems Qualitative Analysis of Human Movement Prerequisite Knowledge for a Qualitative Analysis Tools for Measuring Kinematic Quantities	3

3	**Kinetic Concepts for Analyzing Human Motion** Basic Concepts Related to Kinetics Mechanical Loads on the Human Body Compression, Tension, and Shear Mechanical Stress Torsion, Bending, and Combined Loads The Effects of Loading Repetitive versus Acute Loads Tools for Measuring Kinetic Quantities Vector Algebra	6
4	**Static Forces** 1 Equilibrium and Stability 2 Equilibrium Considerations for the Human Body 3 Stability of the Human Body Under the Action of an External Force 4 Skeletal Muscles 5 Levers	3
5	6 The Elbow 7 The Hip 8 The Back 9 Standing Tip-Toe on One Foot 10 Dynamic Aspects of Posture	3
6	**Friction** 1 Standing at an Incline 2 Friction at the Hip Joint 3 Spine Fin of a Catfish 4 Biotribology	3
7	**Motion of Fluids** 1 Bernoulli's Equation 2 Viscosity and Poiseuille's Law 3 Turbulent Flow 4 Circulation of the Blood 5 Blood Pressure 6 Control of Blood Flow 7 Energetics of Blood Flow 8 Turbulence in the Blood 9 Arteriosclerosis and Blood Flow 10 Power Produced by the Heart 11 Measurement of Blood Pressure 12 Microfluidics	6
8	The Biomechanics of Human body The Biomechanics of Human Bone Growth and Development The Biomechanics of Human Skeletal Articulations The Biomechanics of Human Skeletal Muscle The Biomechanics of the Human Upper Extremity	3
…		
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8^{th} week	30 %
4	Final Exam (theoretical)	13^{th} week	50 %
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	1-Basic biomechanics 6 edd Susan J. Hall, 2011-McGraw-Hill- ISBN 13: 978-0-07-337644-8 2-1-Paul Davidovits "Physics in Biology and Medicine" 5th edd. Elsevier 2019. ISBN 978-0-12-813716-1
Essential References Materials	1-Handbook of physics in medicine and biology, Robert Splinter, CRC Press Taylor & Francis Group, 2010. 2-Biophysics, Roland Glaser, spring-Verlag Berlin Heidelberg, New York, 5th, 2001.
Electronic Materials	https://www.journals.elsevier.com/medical-image-analysis/
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	Computational Medical Physics (2)
Course Code:	PHYM4902-4
Program:	BSc Medical Physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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 11 /4th year	
4. Pre-requisites for this course (if any)**:** Computational Medical 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**	4	100%
2	**Blended**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	36
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify) Exams & quizzes	4
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Computational Medical Physics is designed to cover techniques used in modeling Medical physical systems numerically and analyzing data. It is designed to help the students gain experience with programming languages in carrying out this work. It is also important to know how these programming languages are accessed in an operating system. Computer software is used for diagnosis of diseases. It can be used for the examination of internal organs of the body. Advanced computer-based systems are used to examine delicate organs of the body. Some of the complex surgeries can be performed with the aid of computers. Medical imaging is a vast field that deals with the techniques to create images of the human body for medical purposes. Many of the modern methods of scanning and imaging are largely based on the computer technology.

2. Course Main Objective

- The E-Learning system is being conducted.
- Students should learn a programming language (e.g. Matlab package, visual C++, ….etc).
- To carry out an assay, encourage the students to use different web search engines, writing software packages, statistical software....etc.
- Interpersonal skills, relating to the ability to interact with other people and to engage in team-working through group discussion.
- Problem solving skills, relating to qualitative and quantitative information.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Define the basic knowledge of computer related to the medical signal and/or image processing.	K1
1.2	Outline the basic information & communication technologies (ICT) related to medicine.	K3
1.3	State various image quality enhancement techniques.	K3
1...	Recognize how to improve and develop the medical signal and /or image related to essential different medical imaging (e.g. nuclear medicine, MRI, ophthalmic and US image processing	K2
2	**Skills :**	
2.1	Summarize general areas of image processing.	S2
2.2	Compare between low pass filter and high pass filter.	S1
2.3	Differentiate between Clipping, Point Operations and Look-Up Table (LUT).	S2
2...	Design different codes using a programming language to locate and enhance the medical signal and/or image.	S3
3	**Values:**	
3.1	Illustrate information technology and modern computer tools to locate and retrieve scientific information relevant to computing in medicine.	V1
3.2	Appraise the cooperation through teamwork to assess and criticize various emergent problems.	V2
3.3	Interpret the defined noise and artifacts an in the medical images to be improved using different signal and/or image processing package.	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Loop statements: -The For loop -Nested For loop -While loops -Vectorizing code	8
2	Matlab Programs: -User-defined functions -Application -Variable scope -Debugging -Live scripts	8
3	String Manipulation: -Creating String Variables	8

	-Operation on Strings -Converting between String and Number Types	
4	Data Structure: -Cell Arrays -Structures -Advanced Data Structures -Sorting -Index Vectors	8
5	Advanced File Input and Output -Using MAT-Files for Variables -Writing and Reading Spreadsheet Files -Lower-Level File Input and Output Functions	8
...		30
Total		

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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
			reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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- A Practical Introduction to Programming and Problem Solving, 5th edition. Stormy Attaway. Elsevier 2018. ISBN: 978-0-12815-479-3.
Essential References Materials	1- An Introduction to Programming and Numerical Methods in MATLAB. Steve Otto and James Denier. Springer 2005 ISBN: 978-1-85233-919-7.
Electronic Materials	https://uk.mathworks.com/help/matlab/
Other Learning Materials	

2. Facilities Required

Item	Resources

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart Board, , 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد NCAAA T4 2020

Course Specifications

Course Title:	Physics of Brachytherapy
Course Code:	PHYM4803-3
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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: Level 11 /4th year	
4. Pre-requisites for this course (if any): Physics Of Radiotherapy (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	30	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description

This course provides the necessary practical and theoretical background for the support of a brachytherapy physics service within brachytherapy. The course provides the basis for understanding physical principles within brachytherapy, focusing on clinical application. Important topics are: Equipment for generating/delivering ionizing electron- and photon radiation, clinical radiation dosimetry, characteristics and specifications of radiation fields, treatment planning (volume definitions, field setup, fractionations, modern techniques and dose calculation algorithms), quality assurance, and possibilities and limitations related to treatment modalities.

2. Course Main Objective

To improve the student\s expert in the field of Physics of Radiation Therapy

1- Cooperate with Hospitals to increase student's expert in field

2. Increase the students' open discussions with radiation experts in the department.

3. Encourage students to register to webinars and workshops related to the radiotherapy physics offered hospitals and medical organizations in KSA, in addition to that offered online by IAEA.
4- Encourage the student to write frequently report about different topics in field using references in the library and the SDL
5- Frequently updating of the course topics

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	List the patient dose computation methods	K3
1.2	Outlines about natural background radiation and other sources.	K2
1.3	List the RDLs for conventional x-ray, CT, Mammogram	K2
1...	Describe calibration of thermoluminscence dosimeters	K1
2	State operational radiation quantities	K5
2.1	**Skills :**	
2.2	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.3	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2...	Integrate information technology (IT) based solution into radiation.	S2
3		
3.1	**Values:**	
3.2	Appraise the cooperation through teamwork to make a decision.	V1
3.3	The student knows how to analyse obtained data and how to manage it.-	V1
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**The Early History of Brachytherapy Physics** 1 Introduction 2 Discoveries 3 Ionization and X-Rays 4 α, β, γ and Half-Life 5 Nuclear Transformation 6 Rutherford – Bohr Atom 7 The Start of Brachytherapy 8 Dose Rates 9 Dosimetry Systems 10 Marie Curie	6
2	**Brachytherapy Radionuclides and Their Properties** 1 Introduction 2. 226Radon Source Production 3- Artificially Produced Radionuclides 4- Notation 5- 60Cobalt 6- Teletherapy 7- Brachytherapy sources	6

3	**Production and Construction of Sealed Sources** 1- Introduction 2 -192Iridium Sources 3 -125Iodine LDR Seeds 4 -103Palladium LDR Seeds 5 -169Ytterbium Sources 6 -60Cobalt HDR Sources 7 -137Cesium LDR Sources 8 -198Gold LDR Seeds 9 -170Thulium High Activity Seeds 10- 131Cesium LDR Seeds 11 -Enrichment Methods 12 - β Ray Emitting Microparticles and Nanoparticles	6
4	**Source Specification and Source Calibration** 1 Source Specification 7.2 Source Calibration 3- Calibration Using an In-Air Set-Up 3 Calibration Using a Well-Type Ionization Chamber 4 Formalism 5 Geometrical Conditions 6 Calibration of 192Ir LDR Wires 7 Stability of Well-Type Chamber Response 8 Calibration Using Solid Phantoms	6
5	**Source Dosimetry** 1 Introduction 2 Coordinate Systems and Geometry Definition 3 Models of Dose Rate and Dose Calculation 4 TG-43 Data for Sources 5 Dose Rate Look-Up Tables 6 Dose from Dose Rate	6
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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		internal dose using Medical Internal Radiation Dose.	
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
…	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
…	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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	1-1-The Physics of Radiation Therapy- Faiz M. Khan, John P. Gibbons 2020 -6th ed by Wolters 2-The Physics of Modern Brachytherapy for Oncology D Baltas 2007 by Taylor & Francis INSBN -10: 0-7503-0708-0
Essential References Materials	Walter and Miller's Textbook of Radiotherapy Radiation Physics, Therapy and Oncology 7th ed Edited by Paul Symonds 2012 Elsevier, ISBN 978 0 443 07486 8
Electronic Materials	
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

T4
2020

Course Specifications

Course Title:	Quality Controls for medical physics
Course Code:	PHYM4704-4
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

A. Course Identification

1. Credit hours: 4	
2. Course type **a.** University ☐ College ☐ Department ☒ x Others ☐ **b.** Required ☒ x Elective ☐	
3. Level/year at which this course is offered: Level 11 /4th year	
4. Pre-requisites for this course (if any)**:** Physics of Medical Imaging (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	40	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	40
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Quality Control (QC) refers to the specific test required to ensure effective and safe equipment performance. QC tests check the performance of the equipment under routine clinical conditions, following established protocols for facilities, equipment and procedures. Quality control protocols in imaging and radiotherapy are oriented to ensure the accuracy of the diagnosis or the intervention; while in radiation therapy, the goal is to ensure accurate delivery of the prescribed dose to the tumor in the patient and to minimize the dose to other tissues. Thus, a course should include periodic reviews of referral patterns, clinical protocols, continuing education opportunities for staff, facility inspections, equipment testing, and administrative procedures related to the purchase of supplies and billing. The ultimate goal of QA is to improve patient care.

2. Course Main Objective

Quality Assurance course in medical physics is determined by an analysis of the facility's objectives and resources and should include the following major constituents:

- Responsibilities
- Purchase specifications
- Standards for Image Quality

• Monitoring and Maintenance programs
• Installation/Operational/ Performance qualifications of equipment
• Records
• Quality Assurance Manual

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Outlines about natural background radiation and other sources.	K2
1.2	List the RDLs for conventional x-ray, CT, Mammogram	K2
1.3	Describe calibration of thermoluminescence dosimeters	K1
1.4	State operational radiation quantities	K5
2	**Skills :**	
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2.3	Integrate information technology (IT) based solution into radiation.	S2
2...		
3	**Values:**	
3.1	Appraise the cooperation through teamwork to make a decision.	V1
3.2	The student knows how to analyze obtained data and how to manage it.-	V1
3.3	Knowledge and capability of students to use computers and internet.	V2
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Image Quality and Dose** 1 Characteristics of Image Receptors 2 Contrast 3 Sharpness 4 Noise 5 Signal-to-Noise Ratio 6 Detective Quantum Efficiency 7 Other Image-Quality Figures 8 Dependence of Image Quality on Exposure Parameters 9 Detection of Covered Structures in the X-Ray Image	8
2	**Optimization of Image Quality and Dose** 1 General X-Ray Diagnostics .2 Angiography .3 Mammography .4 Computed Tomography	4
3	**Quality Assurance in Nuclear medicine** 1. Introduction 2. Gamma Cameras Performance 3. General Test Conditions 4. Intrinsic Resolution 5. System Resolution	8

	6. Sensitivity 7. Non-uniformity 8. Count Rate Performance 9. Energy Resolution **10.** Whole Body Scanning	
4	**Quality Management and Improvement in Radiotherapy** 1 Perspective on Quality and Safety in Radiotherapy 2 Quality as Viewed and Lived by the Patient 3 Quality Management: An Overview 4 Quality Management: Radiotherapy 5 Development and Operation of a Quality Management Program 6 Methodologies for Quality Improvement 7 Lean Thinking and Quality Improvement 8 Process Control and Quality Improvement	4
5	**Quality Assurance in Radiotherapy (1)** 1 CT Simulation 2 MRI and MRS Simulation 3 Image Registration, Fusion, and Segmentation 4 4D Simulation 5 Treatment Planning Systems 6 External Beam Radiotherapy 7 Linear Accelerator: Resource Analysis for Commissioning 8 Linear Accelerator: Implementation and Use 9 Cobalt: Implementation and Use 10 Superficial and Orthovoltage: Implementation and Use	4
6	**Quality Assurance in Radiotherapy (2)** 1 Computer-Controlled and Intensity-Modulated Radiotherapy 2 Intensity-Modulated Volumetric Arc Radiotherapy 3 Four-Dimensional Treatment 4 Combined Planning and Delivery Systems 5 Proton Radiotherapy 6 Stereotactic Radiosurgery and Stereotactic Radiation Therapy 7 Total Body Irradiation 8 High Dose Rate Brachytherapy 9 Electronic Brachytherapy 10 Technical Guidance Documents	4
7	**Radiotherapy quality Control Equipment** 1 Dosimetry Equipment and Phantoms 2 Conventional Simulators 3 Computed Tomography, Positron Emission Tomography, and Magnetic Resonance Imaging 4 Stand-Alone External Beam Treatment Planning Systems 5 Conventional Linear Accelerators 6 Linear Accelerator–Based MV and kV Imaging Systems 7 Multileaf Collimator	8
...		
Total		40

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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam
1.2	List the RDLs for conventional x-ray, CT, Mammogram		1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
2.3	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
3.3	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
2	Quiz	All weeks	10 %
3	Midterm's exam	8th week	30 %
4	Final Exam (theoretical)	13th 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- Quality and Safety in Radiotherapy- Todd Pawlicki 2011 by Taylor and Francis Group, INB 13: 978-1-4398-0437-7 2- 2-Practical Nuclear Medicine 2005 Third Edition Peter F. Sharp Howard G. Springer ISBN: 978-1-85233-875-6
Essential References Materials	1- Radiation Exposure and Image Quality in X-Ray by Horst Aichinger,2010 Taylor and Francis Group, INB 13: 978-1-4398-0437-7
Electronic Materials	www.iomp.org www.aapm.org www.afomp.org/
Other Learning Materials	The following journals are recognized as official publications of the IOMP: 1. Physics in Medicine and Biology 2. Physiological Measurement 3. Medical Physics 4. Journal of Applied Clinical Medical Physics 5. Medical Physics International

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	**Graduation Project**
Course Code:	**PHYM4904-4**
Program:	**Physics_43**
Department:	**Physics**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

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: **12/4th 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)

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

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	-
2	**Laboratory/Studio**	40
3	**Tutorial**	-
4	**Others** (specify) Exams/ Quizzes	-
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

Preparatory studies of the literature and data collection for the graduation project in a particular area of concentration and under the supervision of one of the faculty members. The course covers directed readings in the literature of physics, introduction to research methods, seminar discussions dealing with special physics topics of current interest. Planning, design, construction and management of physics project. Writing a scientific report.

2. Course Main Objective

The main aim of this course is to prepare students for the practical tasks of the work place after graduation. This includes building his/her ability to perform a complete project.

Upon completion of this course, the student should be able to:

- Structure a working schedule for the project. -Present Clear aim and objectives of the graduation project.

Show a deep knowledge within the chosen field of physics.

Search and in a critical way interpret and compile relevant scientific literature.

In a creative way delimit a scientific problem, plan a scientific study, choose appropriate methods, carry out the study, interpret and evaluate the results and, if applicable, generate falsifiable a hypotheses to explain the observations all within given time frames.
-Present the literature review with relation to the selected topic.
-Write a technical report.
-Defend the scientific report in front of a committee and be able to answer questions asked by the committee members.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Describe how to perform a scientific research.	K1(P)
1.2	Description of research process.	K1(P)
1.3		K1
1.4		K2
1.5		K3
2	**Skills :**	
2.1	Solve physics issues qualitatively and quantitatively using mathematical and computational methods.	S1(P)
2.2	Explain the physical phenomena mathematically.	S2(P)
2.3		S2
2.4		S2
2.5		S3
3	**Values:**	
3.1	Apply standards of integrity and ethics in all tasks.	V1(P)
3.2	Collaborate and contribute responsibly and effectively in teamwork.	V2(P)
3.3		V3
3...		

C. Course Content

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

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 and Understanding**		
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	**Values**		
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 scientific and research. 7- 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	The students learn independently and take up responsibility.		
3.3			

2. Assessment Tasks for Students

Percentage of Total Assessment Score	Week Due	*Assessment task	#
10%	continuous	Scientific activities	1

Percentage of Total Assessment Score	Week Due	*Assessment task	#
10%	continuous	Collection of Data	2
20%	continuous	Doing a research	3
50%	W 9	Writing report	4
10%	W10	Final oral presentation	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 : 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.)	data show
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. Questionnaries	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 of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Atif Ismail
Reference No.	
Date	

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

اعتماد
NCAAA
T4
2020

Course Specifications

Course Title:	Radiation Protection and Detection
Course Code:	PHYM4502-4
Program:	Medical physics
Department:	Physics
College:	College of applied science
Institution:	Umm Al-Qura University

Table of Contents

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 12 /4th year								
4. Pre-requisites for this course (if any)**:** Quality control for medical physics								
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	40	100%
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	40
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	Total	40

B. Course Objectives and Learning Outcomes

1. Course Description

This course is interested in studying the natural back ground radiation and medical sources, Conventional x-ray dosimetry, Computed tomogram dosimetry, mammogram dosimetry and nuclear medicine dosimetry. In addition to study the concept and measurement of ambient dose equivalent, directional dose equivalent and personal equivalent it interested in managing radioactive contamination, decontamination factor and assessment of skin dose due to decontamination.

2. Course Main Objective

Sources of Radiation , Activity, half-life, exponential attenuation, half-value layer (HVL), inverse square law, tenth-value layer (TVL) , Biological Effects of Radiation , Radiation Quality factor, Equivalent dose, Effective dose , Legal framework for radiation protection (BSS) , As low as reasonably achievable (ALARA) concept ,Occupational, public exposure and annual limits , Radiation protection detectors (Ionization chambers, Geiger-Mueller, Proportional counters, Scintillators, Thermoluminescent Dosimeters (TLDs), neutron detectors) ,Personal

and environmental dosimetry ,Shielding calculation Radioactive transport and waste management , Emergency procedures o Radiation protection program design, implementation and management in the medical sector.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Outlines about natural background radiation and other sources.	K2
1.2	List the RDLs for conventional x-ray, CT, Mammogram	K2
1.3	Describe calibration of thermoluminescence dosimeters	K1
1.4	State operational radiation quantities	K5
2	**Skills :**	
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	S1 &S2
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	S1
2.3	Integrate information technology (IT) based solution into radiation.	S2
2...		
3	**Values:**	
3.1	Appraise the cooperation through teamwork to make a decision.	V1
3.2	The student knows how to analyze obtained data and how to manage it.-	V1
3.3	Knowledge and capability of students to use computers and internet.	V2
3...		

C. Course Content

No	List of Topics	Contact Hours
1	**Radioactivity and radiation** Interaction of radiation with matter Radiation units Biological effects of radiation	2
2	**Natural and man-made radiation** **1.** Introduction **2.** Cosmic radiation **3.** Radiation from terrestrial sources **4.** Naturally Occurring Radioactive Material (NORM) **5.** Radioactivity in the body **6.** Summary of doses from natural radiation **7.** Man-made radiation exposure **8.** Summary of current sources of radiation	4
3	**The system of radiological protection** **1.** The role of the International Commission on Radiological Protection (ICRP) **2.** The recommendations of the International Commission on Radiological Protection **3.** Recommended dose limits **4.** Planned exposure situations **5.** Emergency exposure situations **6.** Existing exposure situations	6
4	**Radiation detection and measurement** **1.** General principles **2.** Ionization of a gas	4

	3. Solid-state detectors **4.** Activation effect **5.** Pulse counting systems **6.** Maintenance, testing and calibration of radiation-monitoring instrumentation	
5	**The external & internal radiation hazard** **1.** Source of the hazard **2,** Time **3.** Distance **4.** Shielding **5.** Neutron sources **6.** Personal dose control **7.** Survey monitoring **8.** Personnel monitoring equipment **9** Uncontained radioactivity **10** Routes of entry **11** Treatment of contaminated personnel **12** Contamination monitoring **13** Personal monitoring	6
6	**Radiation protection in the non-nuclear industry** **1-** X-rays **2.** Sealed sources **3.** Unsealed sources **4.** Naturally Occurring Radioactive Materials (NORM) **5.** Radiation protection in medicine	4
7	**6** Diagnostic procedures **7** Radiotherapy **8** Nuclear medicine **9** Control and disposal of radioactive materials	4
8	**Radiological incidents and emergencies** 1 Introduction 2 International Nuclear and Radiological Event Scale 3 Loss of shielding 4 Loss of containment 5 Uncontrolled criticality 6 Pre-planning for emergencies 7 The emergency organization	6
9	**The organization and administration of radiation protection services** **1** The overall process **2** Standards and regulations **3** Design and operation **4** Review and audit **5** The health physics organization	4
Total		40

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 and Understanding**		
1.1	Outlines about natural background radiation and other sources.	Start each chapter by general idea of the meaning of exposure Demonstrate the course information and principles	1.Home work Interactive 2.discussion 3.Short exam1 4.Short exam2 Final exam

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.2	List the RDLs for conventional x-ray, CT, Mammogram	through lectures. Describing radiation protection concepts with solving problems Describing the procedure of Calculation the internal dose using Medical Internal Radiation Dose.	1.Presentations 2.Quizzes 3.. Problem solving
…	Describe calibration of thermoluminscence dosimeters		1. Oral questions 2. Presentations 3 .Quizzes 4. Problem solving
2.0	**Skills**		
2.1	Evaluating the internal effective dosses for organs in nuclear medicine and related fields of studies.	Lectures	Exam must contain questions that can measure these skills.
2.2	Applying the mathematical expressions in calculating the external and internal doses due to external and internal exposure.	Brain storming	Quiz and exams Discussions after the lecture
2.3	Integrate information technology (IT) based solution into radiation.	Discussion	Quiz and exams Discussions after the lecture
3.0	**Values**		
3.1	Annalise and obtained data and how to manage it.	Case Study - Active learning	Evaluate the scientific values of reports. Evaluate the work in team
3.2	Make a certain decision fast, especially during data acquisition.	Homework (preparing a report on some topics related to the course depending on web sites).	Evaluate the efforts of each student in preparing the report. Evaluation of student presentations
3.3	Enhancing the ability of students to use computers and internet.	Seminars presentation	Evaluate the scientific values of reports. Evaluate the work in team.

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Exercises & Home works	All weeks	10 %
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***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

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F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	1-An Introduction to Radiation Protection Alan Martin 7th Edition 2019 by Taylor & Francis ISBN-13: 978-1-138-33307-9 2-Physics for Radiation Protection James E. Martin 3rd add 2013 Wiley ISBN: 978-3-527-41176-4
Essential References Materials	3- Compendium to Radiation Physics for Medical Physicists: 300 Problems and Solutions Ervin B. Podgoršak Springer 2014 ISBN 978-3-319-25380-0
Electronic Materials	www.iomp.org www.aapm.org www.afomp.org/
Other Learning Materials	The following journals are recognized as official publications of the IOMP: 1. Physics in Medicine and Biology 2. Physiological Measurement 3. Medical Physics 4. Journal of Applied Clinical Medical Physics 5. Medical Physics International

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Classrooms
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show, Smart 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
1. Following up the progress of students in the course.	Instructor	Homework & quiz
2. Evaluating the progress of student	Instructor	Questionnaires.
3. Evaluating the instructor	Student	Questionnaires.
4. Revision of Exam paper	Another staff member	Standers of the exam papers

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.	
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