



Course Specifications

Course Title:	Introduction to medical physics
Course Code:	PHY4605
Program:	Physics
Department:	Physics
College:	Applied Sciences
Institution:	Umm Al-Qura University

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A. Course Identification

1. Credit hours: 3
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input type="checkbox"/> Elective <input checked="" type="checkbox"/>
3. Level/year at which this course is offered: Year 4
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	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	0
3	Tutorial	0
4	Others (specify)	0
	Total	30

B. Course Objectives and Learning Outcomes

1. Course Description The course will cover some of the principles of medical physics. Students will learn how to relate several physics phenomena to the human body, and apply the laws of those phenomena to understand and analyze the physiological processes in the body.
2. Course Main Objective -The aim is to provide students with knowledge and understanding fundamentals of medical physics; 1- To explain the motions of the living bodies . 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.



3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding	
1.1	Recognize facts, principle and concepts of elementary medical Physics	K3
1.2	Describe the physical laws of human body equilibrium	K2
1.3		
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	Relate physics laws to human body	S3
2...	Express the medical physics phenomena mathematically.	S1
3	Values:	
3.1	Work effectively in groups	V1
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	❖ Static force 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 6 The Elbow 7 Friction Standing at an Incline	3
2	❖ Elasticity and Strength of Materials 1 Longitudinal Stretch and Compression 2 A Spring 3 Bone Fracture: Energy Considerations 4 Impulsive Forces 5 Fracture Due to a Fall: Impulsive Force Considerations 6 Airbags: Inflating Collision Protection Devices 7-Whiplash Injury 8 Falling from Great Height 9 Osteoarthritis and Exercise.	3
3	❖ The 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	3



	9 Arteriosclerosis and Blood Flow 10 Power Produced by the Heart 11 Measurement of Blood Pressure	
4	❖ 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	3
5	❖ 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 8 Ultrasonic Waves	3
6	❖ 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	3
7	❖ 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	3
8	❖ Atomic Physics 1 The Atom 2 Spectroscopy 3 Quantum Mechanics	3



	4 Electron Microscope 5 X-rays 6 X-ray Computerized Tomography 7 Lasers & Lasers applications in medicine	
9	❖ 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	3
10	Nanotechnology in Biology and Medicine 1 Nanostructures 2 Nanotechnology 3 Some Properties of Nanostructures 4 Medical Applications of Nanotechnology 5 Concerns Over Use of Nanoparticles in Consumer Products	3
...		
Total		30

D. Teaching and Assessment

1. A 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	1. Midterm's exam.
2.2	Solve problems in Physics by using suitable mathematical principles	2. Following some proofs	Exams, short quizzes
...	Analyse and interpret quantitative results	3. Define duties for each chapter	2. Asking about physical laws previously taught
	Express the medical physical phenomena mathematically.	4. Encourage the student to look for the information in different references 5. Ask the student to attend lectures for practice solving problem	3. Writing reports on selected parts of the course 4. Discussions of how to simplify or analyze some phenomena
3.0	Values		



Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
3.1	Communicate effectively in oral and written form	<ul style="list-style-type: none"> • Homework • Preparing a report on some topics related to the course depending on web sites. 	<ul style="list-style-type: none"> • 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	Mid-Term Exam	6	30%
2	Homework and Quizzes	Through term	20%
3	Final Exam	13	50%
4	Mid-Term Exam	6	30%

*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:

Different arrangements made by teaching staff to support student consultations:

- Office hours: 8h per a week for each academic member.
- Academic guidance: an academic member has a number of students to guide them throughout degree journey.

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	1-John R. Cameron & James G. Skofronick "Medical physics" Willy John 1988 2-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.)	A classroom with movable tables and chairs conducive to group discussion and teamwork.
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
Effectiveness of teaching	Peer Reviewer	Direct
Effectiveness of assessment	Students	Indirect
Extent of achievement of course learning outcomes	Peer Reviewer	Direct
Quality of learning resources	Program Leaders & Faculty	Direct

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

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

Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	

