Course Specifications

Institution: Umm Al-Qura University	Date:	12/12/2018
College/Department: Common First Year/ Natural sciences department		

A. Course Identification and General Information

1. Course title and code: Introduction to Medical Physics, 4800131-4
2. Credit hours: 4 credit hours (3+1)
3. Program(s) in which the course is offered.
Common First Year (Medical Track)
4. Name of faculty member responsible for the course: Members of staff.
5. Level/year at which this course is offered: Common First Year
6. Pre-requisites for this course (if any): None
7. Co-requisites for this course (if any): None.
8. Location if not on main campus: Main Campus
9. Mode of Instruction (mark all that apply):

a. traditional classroom	√	What percentage?	75%
b. blended (traditional and online)		What percentage?	
c. e-learning	√	What percentage?	25%
d. correspondence		What percentage?	
f. other		What percentage?	

Comments:

B Objectives

1. What is the main purpose for this course?

The course aims to student to acquire the basic concepts and skills of physics and to be aware of the role of physics in medicine. The knowledge of physics can help student to understand how work some parts the human body systems, such as the study of forces on muscles, bones and joints, the circulation of blood inside arteries and capillaries, the role of gravity on the blood circulation, the mechanism of human vision, the correction of some eye defects, the resting of radioactive substances in human organs and the ionizing radiation. Also, this course can help students in medicine to easily understand how to use sophisticated techniques and instruments in diagnosis, therapy and surgery, such as medical imaging, radiation equipment and endoscopic surgery

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

- Distinguish between fundamental and derived units
- Convert units from a system to another and calculate medical doses.
- Describe the motion in one dimension, calculate the instantaneous and average velocities and accelerations
- Describe the motion of objects under free falling
- Distinguish between scalar and vector quantities, adding, subtracting and multiplication of vectors
- Describe the motion in two dimensions
- Understand the concepts of mass and force and to apply the newton's laws to analyze the motion of an object
- Calculate the torque and examine the equilibrium and the stability of different parts of the human body in different positions
- Calculate the mechanical advantage of mechanical levers and associate some parts of the human body to one of the three classes of levers.
- Estimate the work done by a constant force, the kinetic energy and apply the work-energy principle
- Make the difference between conservative and non-conservative forces and to use the principle of mechanical energy conservation
- Know the properties of fluids, the Archimedes' principle, calculate the static pressure, gauge pressure, blood pressure, flow rate, velocity of fluid by applying the equation of continuity and the Bernoulli's theorem
- Define the viscosity of a fluid
- Calculate the flow resistance and apply the Poiseuille's law to estimate the pressure drop in different parts of the circulatory system (applying the analogy with Ohm's law in electric circuits)
- Understand the mechanism of vision, calculate the power of lenses and the power accommodation of the human eye.
- Understand the different defects of the human eye and calculate the power of glasses used the correct the vision.
- Distinguish between physical and biological half-life.
- Calculate the effective half-life of a radioelement injected in the human body
- Calculate the remaining fraction of radionuclides in a radioactivity decay
- Classify the different types of ionizing radiations.
- Calculate the absorbed dose

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

- Continues updating for content of lectures as a result of recent achievements and researches in the field.
- Encouraging the students to deal with electronic books, as they are using many web-based reference materials and by providing them with continues update for information.
- Trying to decrease the direct theoretical teaching load of the course and putting more time for explaining correlations and student-directed learning sessions and seminars.
- Planning for elective self-studies in the course to encourage students to engage in depth study of areas of interest.
- More efforts will be exerted to develop and improve the course to enable the student to clearly understand the Physics basis.

C. Course Description (Note: General description in the form used in Bulletin or handbook)

Course Description:

1. Topics to be Covered

List of Topics: Theoretical course	No. of Weeks	Contact hours
Describing motion on a straight line	2	6
Describing motion in two dimensions	1	3
Newton's laws of motion	2	6
Statics	2	6
Work and Energy	1	3
Viscous Fluids	2	6
Non-Viscous Fluids	1	3
Mirrors Lenses and Optical Systems	2	6
Nuclear Physics	1	3
Ionizing Radiation	1	3

Topics to be Covered: Experimental work

List of Topics	No. of Weeks	Contact hours
General introduction to the laboratory environment	1	2
Graphing skills	1	2
Writing Lab reports	1	2
Measurements	1	2
The free-falling experiment	1	2
The Simple pendulum	1	2
Measurement of speed of sound in air	1	2

Vectors addition: the force table	2	4
Measurement of viscosity	1	2
The measurement of focal length of optical lenses	1	2
Revision	2	4
Lab final exam	1	2

2. Course components (total contact hours and credits per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other:	Total
Contact Hours	Planed	45	--------		30		65
	Actual	42	--------		28		60
Credit	Planed	3			1		4
	Actual	3			1		4

3. Additional private study/learning hours expected for students per week.
There is no scheduled private study/ learning hours but the students can directly contact the lecturer during his office hours.

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment to be used in the course to evaluate learning outcomes in the domain concerned.

On the table below are the five NQF Learning Domains, numbered in the left column.

First, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	**Knowledge:** At the end of this course, the students are expected to be able to:		
1.1	Identifying standards and units and calculate medical doses	-Lectures, -Informative lecture notes with learning objectives. - Demonstrations - Group discussions - Summary -Problem solving - Laboratory Experiments	-Oral Questions -Essay questions - Homeworks - Short Quizzes - Lab reports Exams: -Midterm exam 30% -Final Exam 40% -Lab exam 10% -Lab reports 10%
1.2	Describe motion from the kinematics point of view		
1.3	Use mathematical vectors to describe motion in two dimensions		
1.4	Concepts of mass and force - describing motion by application of Newton's laws		
1.5	Kinetic energy, potential energy and the conservation of mechanical energy		
1.6	Identify viscous and non -viscous fluids		

1.7	Identify the principal laws and theorems to describe each type of fluid flow.		- Continues Ass. 10%
1.8	Calculation the power of thin lenses and construction of the image formation through optical lenses		
1.9	The different types of aberration and how to solve them		
1.10	Correction of human eye defects by using of eyeglasses		
1.11	Be familiar with the calculation of radioactive fraction during a radioactivity decay.		
1.13	Classification of the different types of ionizing radiations.		
1.14	Calculate the absorbed radiative doses		
2.0	**Cognitive Skills:** The course has an aim to improve the ability in the following cognitive skills:		
2.1	How to use laws of Physics and principles to understand the subject.	Preparing main outlines for teaching. Following some proofs. Define duties for each chapter Home-work assignments. Ask the student to do small research. Encourage the student to look for the information in different references. Ask the student to attend lectures for practice solving problem	Improvement in the overall performance of the student in consequent examinations during the course. Interaction of the course and its effect on other courses offered for the students, which can be measured by their feedback. Also; Midterm Exam, Exams, short quizzes. Asking about physical laws previously taught Writing reports on selected parts of the course Midterm Exam. Final Exam, Lab Exam, and short quizzes. Discussions of how to simplify or analyze some phenomena
2.2	How to simplify problems and analyze phenomena.		
2.3	Analyze and explain natural phenomena.		
2.4	Ability to explain the idea with the student own words		
2.5	Represent the problems mathematically		
2.6	Develop Effective Learning skills.		
2.7	Improve the problem solving skill		
2.8	Develop self-assessment skills		
3.0	**Interpersonal Skills & Responsibility:** The course has an aim to improve the ability in the following interpersonal skills and responsibilities:		
3.1	Working independently	Internet and Library search. How to cover missed lectures. Summarize lectures Solve difficulties in Develop the interest in Science through :(lab work, field trips, visits to scientific and research. Encourage the student to attend lectures regularly by: Giving bonus marks for attendance Assigning marks for attendance.	Those skills are reflected on the student behaviour inside and outside the class. It can be assessed by the feedback from the lecturer regard the student's interaction and behaviour. Also; -Quizzes on the previous lecture. -Checking report on internet use and trips -Discussion. -The accuracy of the result gained by each group will indicate good group work.
3.2	The students learn independently and take up responsibility		
3.3	Following the learner manners and ethics including; commitment, respect and communication with confidence		

		Give students tasks of duties.	-Presenting the required research on time and the degree of the quality will show the sense of responsibility.
4.0	**Communication, Information Technology, Numerical:** The course has an aim to improve the ability in the following Information Technology and Numerical Skills		
4.1	Computation and designing presentations.	Provide computer facilities	Their interaction with the lectures and discussions. The reports of different asked tasks. Homework, Problem solutions assignment and exam should focus on the understanding. Results of computations and analysis. Comments on some resulting numbers
4.2	Problem solving.	Learn how to use open source software	
4.3	Graphing plots	Use scientific calculators	
4.5	Improve communication quality	Data presentation and analysis of lab measurements	
4.6	Data analysis and interpretation.	How to make oral presentation	
4.7	Enhance the ability to use the search engines		
5.0	**Psychomotor**		
5.1	Contributions in the improvement of Physics education level.	-Provide the role and the fundamental of Physics for Medical students. -Develop basic laboratory skills and techniques for the study of Physics.	Not Assigned

5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Quizzes +Homework.	Around the semester.	10 %
2	Mid- term exam	8	30%
3	Lab report.	Around the semester.	10 %
4	Practical Exam (Lab Final Exam).	15	10%
5	Final Exam	16	40 %
	Total Assessment		100%

D. Student Academic Counseling and Support

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

The student has the right to contact the lecturer or coordinators by their e-mails or during their office hours for academic advices or consultations.

E. Learning Resources

1. List Required Textbooks

- General Physics, 2nd Edition, by Morton M. Sternheim, Joseph W. Kane Wiley; (January 1991), ISBN-13: 978-0471522782.

2. List Essential References Materials (Journals, Reports, etc.)

- Physics for scientists and engineering by Serway 7Th edition.,Cengage Learning; (February 20, 2007).
- Fundamentals of Physics: Mechanics, Relativity, and Thermodynamics (The Open Yale Courses Series),Yale University Press (December 2, 2013)

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

- Fundamentals of PHYSICS, 9th Edition, by HALLIDAY / RESNICK / WALKER.
- Electromagnetism Principles and Applications by Paul Lorrain and Dale R. Corson.
- Physics for student of science and Engineering by A.L.Stanford and J.M. Tanner.,Harcourt College Pub (January 1985).

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

- http://www.physicsclassroom.com
- http://www2.rps205.com/Parents/Academics/Learning/Science/Pages/Physics-First.aspx
- http://ocw.mit.edu/OcwWeb/Physics/8-02Electricity-and-Magnetism/VideoLectures/index.htm
- http://ocw.mit.edu/courses/physics/8-01sc-physics-i-classical-mechanics-fall-2010/
- http://www.cabrillo.edu/~jmccullough/Physics/
- http://www.hgs.k12.va.us/PHYSICS_HOME_PAGE.htm

F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)
Four equipped laboratories

2. Technology resources (AV, data show, Smart Board, software, etc.)
Audio-visual equipment for teaching (projector, microphones, speakers, board)

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)
None

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching

2. Other Strategies for Evaluation of Teaching by the Instructor or by the Department Evaluation questionnaires of the staff at the end of the semester.
3. Processes for Improvement of Teaching Reviewing and implementing appropriate changes in the course based on: ▪ The student feedback and evaluations. ▪ The staff feedback and evaluations. ▪ Static analysis of the student grads
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution) None
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement. ▪ Regular meeting with the staff to review the course effectiveness. ▪ Conferences and meetings on related topics and new finding in medical physics.

Course Coordinator: _____