TISHK INTERNATIONAL UNIVERSITY
FACULTY OF APPLIED SCIENCE
Department of MEDICAL ANALYSIS,
-2022 Spring
Course Information for MA 108 BIOPHYSICS

Course Name:	BIOPHYSICS

Code	Regular Semester	Theoretical	Practical	Credits	ECTS
MA 108	1	2	2	3	4

Name of Lecturer(s)-Academic Title:	Runak Tahr - PH.D
Teaching Assistant:	Assist. Prof. Dr. Ronak Taher Ali
Course Language:	english
Course Type:	Main
Office Hours	Monday
Contact Email:	runak.tahr@tiu.edu.iq Tel:07504964534
Teacher's academic profile:	Assist. Prof
Course Objectives:	1. the most important application of physics in medicine involves: • The field of radiology. • Physics principle of instruments used in medical diagnosis and therapy. • Nuclear medicine used in medical diagnosis and therapy. • Radiation protection in medicine. 2. The application of Physics such as: Mechanism, heat, light, sound, electricity and magnetism to medicine Of various organ system such as the eyes, ears, lungs, the heart and circulatory system. 3. In this course of medical physics learning, students must understand not just THAT a medicine works for a particular ailment, but WHY and HOW it will work and when comparing different methods of treatment, WHICH one will be the most efficacious. 4. keep the student well informed with developments of newer physiological instruments device of radiation that provide better remedy of diseases with least adverse – effects. 5. The knowledge gained in medical Physics should bind together the integration of clinical skills, the understanding of disease and the effective use of Physical means.
Course Description (Course overview):	1. This survey course is an introduction to the different medical imaging modalities, including x-rays, nuclear medicine, ultrasound, computed tomography and magnetic resonance imaging. The physical and mathematical principles involved in the formation of medical images will be presented, along with discussions of the limitations to resolution and image noise. Examples of primary applications for each modality will be given. 2. This course will introduce the role of diagnostic imaging in detecting molecules, genes, and cells in vivo. Emphasis will be in how these techniques can help study molecular mechanisms of disease in vivo. Topics include DNA/protein synthesis, transgenic mice, novel contrast agents and small animal imaging. 3. Nature and effects of ionizing radiation on biomolecular structures and living cells, applied radiobiology and radionuclides. Genetic effects of ionizing radiation and methods of protection. 4. Fundamental physics and instrumentation of biomedical ultrasound imaging presented at a level suited to graduate students performing thesis research in ultrasound imaging.

COURSE CONTENT

Week	Hour	Date	Topic
1	2	27-31/3/2022	1. Terminology& Analog measurements in medicine
2	2	3-7/4/2022	Physics of Diagnostic X-Rays and imaging -Part I
3	2	10-14/4/2022	Physics of Diagnostic X-Rays and - Part II
4	2	17-21/4/2022	Radiation protection in medicine.
5	2	24-28/4/2022	6. Physics of Radiotherapy.
6	2	8-12/5/2022	7-Ultrasound in Medicine
7	2	15-19/5/2022	Midterm Exam
8	2	22-26/5/2022	MRI (Magnetic Resonance Imaging)

9	2	29/5-2/6/2022	Nuclear Medicine
10	2	5-9/6/2022	Heat therapy
11	2	12-16/6/2022	Biological effects of Radiation
12	2	19-23/6/2022	Final Exam
13	2	26-30/6/2022	Final Exam

COURSE/STUDENT LEARNING OUTCOMES

1	1. Describing the early stages of medical physics
2	2. Analyze technologies designed to introduce energy into tissues.
3	3. Understand key concepts specific to energy deposition for both ionizing photon interactions and transport in matter
4	4. Learn the physics and technology of medical imaging system and the design parameters that determine image contrast, noise, spatial resolution, and patient radiation dose.
5	5. Apply a knowledge of modern treatment planning x-ray systems and physics to analyze physical methods behind dose planning and energy transport in tissue and apply this knowledge to perform theoretical dose calculations with the appropriate software.

COURSE'S CONTRIBUTION TO PROGRAM OUTCOMES

(Blank : no contribution, I: Introduction, P: Profecient, A: Advanced)

	Program Learning Outcomes	**Cont.**
1	Evaluate clinical laboratory data by interpreting laboratory results and relating the data to various disease states.	P
2	apply principles of evidence-based medicine to determine clinical diagnoses.	P
3	apply the basic principles of gross and microscopic anatomy, physiology, biochemistry, immunology, microbiology/virology.	P
4	formulate and implement acceptable treatment modalities to various disease states.	A
5	use technology effectively in the delivery of instruction, assessment, and professional development.	A
6	exhibit essential employability qualities by demonstrating laboratory safety, analyzing laboratory results, and displaying professional conduct.	A
7	exhibit organizational skills, accountability, and ethical behavior.	P
8	apply skills needed in operating laboratory equipment for testing, assessing quality assurance for lab equipment, and adhering to standard safety practices in the laboratory environment.	P
9	apply problem-solving and decision-making skills.	P
10	apply and promote health policies and regulatory standards in the field career.	P
11	develop research in the field of medical analysis using qualitative and quantitative methods.	P

Prerequisites (Course Reading List and References):	1. Medical physics (John R. Cameron) 1978 ,1993,1999,2003 and 2008 3. Introduction to physics in modern medicine (Suzanne A. kane) 2010 4. Electronics in medicine and biomedical instrumentation (Nandini K. Jog) 2006 5. Radiation protection and dosimetry (Michel G. Stabin) 2012 6. Dr.R.N.Roy .Atext book of Biophysics 1st edition,2005 7- Physics of radiotherapy Khan 2012
Student's obligation (Special Requirements):	• The student is expected to attend all classes and lab sessions. • Repeated tardiness and leaving labs prior to dismissal is a set -up for failure. • Absence of the student equivalent in excess of 5%, under which the student gets an initial warning. • Absence of the student equivalent of 10%, whereby the student gets the final warning and will be reported to the Dean’s office. • Absence in excess of 10% is defined as unsatisfactory progress and is a set -up for failure related to that subject.
Course Book/Textbook:	Medical physics (John R. Cameron) 1978 ,1993,1999,2003 and 2008 3. Introduction to physics in modern medicine (Suzanne A. kane) 2010 4. Electronics in medicine and biomedical instrumentation (Nandini K. Jog) 2006 5. Radiation protection and dosimetry (Michel G. Stabin) 2012 6. Dr.R.N.Roy .Atext book of Biophysics 1st edition,2005 7- Physics of radiotherapy Khan 2012
Other Course Materials/References:	1- 2014- Diagnostic Radiology Physics. 2020_Khan’s the Physics of Radiation Therapy. 2020_ Introduction of physics in Modern Medicine. 2019-Diagnostic Ultrasound Physics and Equipment. 2020- Magnetic Resonance Imaging (MRI). 2020_@ Radiological Physics with Cases (Important).
Teaching Methods (Forms of Teaching):	Practical sessions, Assignments, Case studies, Report, Quiz,

COURSE EVALUATION CRITERIA

Method	Quantity	Percentage (%)
Attendance	1	5
Quiz	1	5
Midterm Exam	1	30
Laboratory	1	10
Practical Exam	2	5
Final Exam	1	40
Total		**100**

Examinations: Essay Questions, True-False, Fill in the Blanks, Multiple Choices, Short Answers, Matching, , ,

Extra Notes:

ECTS (ALLOCATED BASED ON STUDENT) WORKLOAD

Activities	Quantity	Workload Hours for 1 quantity*	Total Workload
Theoretical Hours	13	2	26
Practical Hours	13	2	13
Final Exam	1		
Attendance	1		0
Quiz	1		0
Midterm Exam	1		0
Laboratory	1		0
Practical Exam	2		0
Total Workload			**39**
ECTS Credit (Total workload/25)			**1.56**

Peer review

Signature:	Signature:	Signature:
Name:	Name:	Name:
Lecturer	Head of Department	Dean