Module (Course Syllabus) Catalogue

2024-2023

College/ Institute	Medical Technical Institute- Erbil	
Department	Radiology	
Module Name	Basic Radiation Physics	
Module Code	BRP 205	
Degree	Technical Diploma [-] Bachelor [ ] High Diploma [ ] Master [ ] PhD [ ]	
Semester	2	
Qualification	Ph. D.	
Scientific Title	Lecturer	
ECTS (Credits)	6	
Module type	Prerequisite [-] Core [ ] Assist. [ ]	
Weekly hours		
Weekly hours (Theory)	(2)hr Class	(156)Total hrs Workload
Weekly hours (Practical)	(6)hr Class	(468)Total hrs Workload
Number of Weeks	8	
Lecturer (Theory)	Dr. Sarwar Ibrahim Saleh	
E-Mail & Mobile NO.	Sarwar.ibrahim@epu.edu.iq 07504550994, 07824550994, 07702462896	
Lecturer (Practical)	Shayma Khatab, Noor Nafeh	
E-Mail & Mobile NO.	07500309570, 07508608622	
Websites	1- THE PHYSICS OF RADIOLOGY AND IMAGING/ K Thayalan 2- Radiation Physics and its applications in diagnostic radiological techniques	

Course Book

Course Description	This lecture is intended as an assistant textbook in radiation physics and its applications in diagnostic radiological techniques in applied academic medical graduate programs. The lecture may also be of interest for the large number of professional physicists, who in their daily occupations deal with medical physics and have a need to improve their understanding of radiation physics and to all medical postgraduate programs.
Course objectives	This lecture is based on notes that we developed over the past years of teaching radiation physics to students in radiological techniques department at the college of medical technology. It contains two chapters, each chapter covering a specific group of subjects related to radiation physics that form the basic knowledge required from professionals working in different medical imaging fields.
Student's obligation	In contrast to other physics specialties, such as nuclear physics, solid-state physics, and high-energy physics, studies of modern medical physics attract a much broader base of professionals including graduate students in medical imaging residents and technology students in diagnostic imaging and therapeutic radiation oncology, students in biomedical engineering, and students in radiation safety and radiation dosimeter educational programs. All these professionals have a common desire to improve their knowledge of the physics that underlies the application of radiation in diagnosis and treatment of disease.
Required Learning Materials	lecture halls with data show equipment for lecture presentations, white board, overhead projector, posters

Evaluation

Task		Weight (Marks)	Due Week	Relevant Learning Outcome
Paper Review		-		
Assignments	Homework	%10		
	Class Activity	%2		
	Report	%5		
	Seminar	%10		
	Essay	-		
	Project	-		
Quiz		%8		
Lab.		-		

	Midterm Exam	%25		
	Final Exam	%40		
	Total	%100		

Specific learning outcome:	1- Radiation physics and its applications in diagnostic radiological techniques. 2- The interest for the large number of professional physicists, who in their daily occupations deal with medical physics. 3- To improve their understanding of radiation physics and to all medical postgraduate programs. 4- Covering a specific group of subjects related to radiation physics that form the basic knowledge required from professionals working in different medical imaging fields. 5- All these professionals have a common desire to improve their knowledge of the physics that underlies the application of radiation in diagnosis and treatment of disease.
Course References:	**1-THE PHYSICS OF RADIOLOGY AND IMAGING/ K Thayalan** **2- Radiation Physics and its applications in diagnostic radiological techniques**

Course topics (Theory)	**Week**	**Learning Outcome**
RADIATION AND ATOM **1.1 The Atom** **1.1.1 Fundamental Particles** **1.1.2 Atomic Structure** **1.1.3 Binding Energy** **1.2 Wave-Particle Duality** **1.3 Radiation** **1.3.1 Non-Ionizing Radiation** **1.3.2 Ionizing Radiation**	1	
1.4 Types of Ionizing Radiation **1.4.1 Particle Radiation** **1.4.1.1 Alpha Particles** **1.4.1.2 Beta Particles** **1.4.1.3Neutron Radiation** **1.4.1 Types of Electromagnetic Ionizing Radiation** **1.4.1.2 Gamma Rays** **1.4.1.3 X-Rays** **1.4.1.4 Ultraviolet**	2	
1.4 Inverse Square Law for Radiation **1.5 Properties Considered When Ionizing Radiation Measured**	3	

1.6.1 Radiologic Units **1.6.2 Roentgen (R)** **1.6. 3 Rad** **1.6.4 Rem** **1.6.5 Curie** **1.6.6 Electron Volt**		
1.7 Practical Units **1.7.1 Absorbed Dose** **1.7.2 Equivalent Dose** **1.7.3 Effective Dose** **PRODUCTION OF X-RAYS** **2.1 Basic Requirements for Production of X-Rays**	4	
Midterm Exam		
2.1.1 Supply of Electrons **2.1.2 Movement of the Electrons** **2.2 Components and Properties of an X-Ray Tube** **2.2.1 Cathode** **2.2.3 Processes Occurring in the Anode of an X-Ray Tube** **2.3 X-Ray Generator Options** **2.3.1 Kilovoltage** **2.3.2 Focal Spot** **2.4 Inherent Filtration** **2.5 Cooling Requirements**	5	
2.6 Production of X-Rays **2.7 The X-Ray Tube** **2.8 The Origin of Characteristic X-Rays** **2.9 Continuous X-Ray Spectrum** **2.10 Characteristic X-Ray Spectrum**	6	
2.11 Controlling the X-Ray Spectrum **2.12 Affects of Voltage and Ampérage on X-Ray Production**	7	
2.12.1 Effect of Voltage **2.12.2 Effect of Amperage**	8	
Final Exam		
Practical Topics	**Week**	**Learning Outcome**
Ohms law	1	

Simple pendulum	2	
Focal length for convex lens	3	
X- ray	4	
Spectrophotometer	5	
Snell law	6	
Fundamental Concepts/ Measurement and units/ Mechanics/ VELOCITY AND ACCELERATION/ SCALAR AND VECTOR QUANTITIES/ FORCE/ ELECTROMAGNETIC RADIATION/ WAVE CHARACTERISTICS/	7	
PARTICLE CHARACTERISTICS/ MASS ENERGY EQUIVALENCE/ ELECTROMAGNETIC SPECTRUM/ CAPACITANCE/ CAPACITOR/	8	
ELECTRICAL CURRENT/ DIRECTION OF CURRENT/ OHM'S LAW/ RESISTANCE/ Physics of X-rays /Production of X-rays/ X-ray tube design/	9	

Questions Example Design

Q1/ Define the followings.
Q2/ Fill the following blanks.
Q3/ Solve the following mathematical question.
Q4/ Enumerate the followings.

Extra notes:

External Evaluator

دوای پیداچونەوەی کورس بوکی (د. سە روە ر ابراهیم صالح) لە بابەتی فیزیای تیشکی و لە ئە نجامدا بۆم دەرکەوت بابەت و ناونیشانی وانەکان بە گشتی لە روی زانستی و پزیشکیەوە گونجاوە لەگەل وانەکە و زانیاری قوتابیان پر دەکاتەوە لەو بوارەی کە قوتابیان سوودی لێ ببینن لە پیشەکەیاندا.

م. چیمن بکر اسماعیل
ماستەرلە فیزیا/ پەیمانگای تەکنیکی پزیشکی