Course Specification
(Bachelor)

Course Title:	Radiation Physics and Dosimetry
Course Code:	PHYS 622
Program:	Master of Science in Physics
Department:	Physics
College:	Science
Institution:	Majmaah University
Version:	I
Last Revision Date:	30/12/2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (3)					
(2,2,0)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track1-	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 2nd/1)					
4. Course General Description:					
Basic principles of radiation physics: radioactivity, the physics of ionizing radiation, X-ray production, interactions of radiation, radiation dosimetry, radiation exposure, dose deposition, radiation shielding, and radiation detectors. Imaging equipment and radiation therapy equipment. The course will include lectures and demonstrations of clinical equipment applications. Provide a basic understanding of ionizing radiation. Course topics will consist of radiation detection. The course will also cover basic mathematical and physics concepts necessary to understand the above issues.					
5. Pre-requirements for this course (if any)**:**					
Advanced Quantum Mechanics, PHYS 612 Electrodynamics, PHYS 613					
6. Co-requisites for this course (if any)**:**					
N/A					
7. Course Main Objective(s):					
• **The course will cover basic mathematical and physics concepts necessary to understanding the following aims: Basic principles of radiation physics: radioactivity, the physics of ionizing radiation,** • **Radioactivity, x-ray attenuation, quality, and production,** • **Interactions of different kinds of radiation with matter, quality factors,** • **Radiation dosimetry, radiation exposure, dose deposition,** **Radiation shielding and radiation detectors.**					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	**3**	100%
2	E-learning		
3	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	30
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	
Total		45

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Describe basic principles of radiation physics: radioactivity, the physics of ionizing radiation.	K2	Lectures Group Discussion	Supervisor evaluation Internal evaluation
1.2	Describe x-ray production, radiation interactions, dosimetry, exposure, dose deposition, shielding, and detectors.	K3		
...				
2.0	**Skills**			
2.1	Apply mathematical and experimental knowledge to any physical phenomenon to understand its behavior.	S2	**Problem solving. Homework**	**Exams, homework, classwork, quizzes. Assignment**

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
2.2	Solve the numerical problems with confidence.	S3		
...				
3.0	**Values, autonomy, and responsibility**			
3.1	Work effectively both in groups and individually.	V2	**Presentation, reports**	**Oral exams, Assignments**
3.2	Present a short report in written form and orally using appropriate scientific language.	V3		
...				

C. Course Content

No	List of Topics	Contact Hours
1	Atomic and nuclear structure; Structure of Matter; Sources of radiation; Classification of radiation; quantities and units for radiation.	**5**
2	Radioactivity and radioactive decay, measurements of radioactivity, and standards.	**5**
3	Interaction of radiation with matter, Photons: interaction and attenuation, attenuation coefficients; Interactions of neutrons; directly ionizing radiation; charged particle equilibrium (Particulate Radiation).	**4**
4	Radiation dosimetry, Radiation Detection, Cavity theory, and ionization chambers.	**4**
5	In vivo dosimetry, Radiation dosimetry, Radiation Shielding, and Medical physics equipment.	**4**
6	X-rays: Properties and Interactions; Quality of x-rays; production.	**4**
7	Introduction to radiation detectors, radiation detection, exposure and dose, and equipment demonstration.	**4**
8	Geiger-Müller Counter Experiment: Understanding and using a GM counter.	**5**
9	Scintillation Detector Usage: Application of scintillation detectors in radiation measurement	**5**
10	Environmental Radiation Survey: Conducting a radiation survey in a local area	**5**
11	Radon Measurement: Techniques for Measuring Radon Levels.	**5**
12	Dosimetry Experiment: Using dosimeters to measure radiation exposure.	**5**

13	Spectroscopy Experiment: Gamma-ray spectroscopy for radiation analysis	**5**
14	Summary and Advanced Topics	3
15	Final Review and Exam Preparation	3
Total		**45**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid exam*	week 6	15%
2.	e-learning quizzes	One/ Semester	10%
3.	Homework	Every Lecture	15%
4.	Discussions	Every week	10%
5.	Writing Report	One/ Semester	10%
6.	Final exam *	End of the semester	40%
7.	Final Exam	16th	40 %

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Radiation detection and measurement, Glenn F. Knoll. -4th ed., WILEY @Q John Wiley & Sons, Inc. ISBN: 978-0-470-13148-0
Supportive References	Introduction to Radiological Physics and Radiation Dosimetry by Frank Herbert Attix, September 2008, Wiley ISBN: 978-3-527-61714-2
Electronic Materials	Electronic Saudi Library
Other Learning Materials	https://www.guru99.com/data-science-tutorial.html

2. Required Facilities and Equipment

Items	Resources
facilities	Classrooms, data show, Smart Board, software

Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	
Technology equipment (projector, smart board, software)	Computer Lab. and Internet Lab.
Other equipment (depending on the nature of the specialty)	Library, Wi-Fi internet connections

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Staff members (Peer Reviewer)	Direct (Student evaluation electronically organized by the Deanship of Registration and Admission)/ Verification of students' papers
Effectiveness of Students assessment	Staff members (Peer Reviewer)	Indirect (Frequent meetings and consultation among the teaching staff)
Quality of learning resources	Staff members (Peer Reviewer)	Indirect (Frequent meetings and consultation among the teaching staff)
The extent to which CLOs have been achieved	Quality member	Direct (Meeting between course coordinators and the tutors)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Physics Department Council
REFERENCE NO.	**16**
DATE	30/12/2024