The University of Jordan

الجامعة الاردنية

Form: Course Syllabus	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
	Number and Date of Revision or Modification	
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	Number of Pages	06

1.	**Course Title**	Radiation Protection
2.	**Course Number**	0342744
3.	**Credit Hours (Theory, Practical)**	3 Credit Hours (Theory)
	Contact Hours (Theory, Practical)	3 Theory
4.	**Prerequisites/ Corequisites**	0302740 or simultaneous
5.	**Program Title**	Master Degree in Medical Physics
6.	**Program Code**	2
7.	**School/ Center**	Science
8.	**Department**	Physics
9.	**Course Level**	Graduate - 700
10.	**Year of Study and Semester (s)**	1st Semester, 2024/2025
11.	**Other Department(s) Involved in Teaching the Course**	None
12.	**Main Learning Language**	English
13.	**Learning Types**	☒Face to face learning ☐Blended ☐Fully online
14.	**Online Platforms(s)**	☒Moodle ☒Microsoft Teams
15.	**Issuing Date**	9-1-2025
16.	**Revision Date**	

17. Course Coordinator:

Name: Prof. Issa Al-Shakhrah Contact hours: 3 hrs

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18. Other Instructors:

Name:
Office number:
Phone number:
Email:
Contact hours:
Name:
Office number:
Phone number:
Email:
Contact hours:

19. Course Description:

As stated in the approved study plan. The development of a radiation technology and its applications, the need for radiation protection, the unifying concepts) binding and energy levels for different elements, dose and energy …etc.) in radiation protection, principles of protection against ionizing radiation, radiation dose calculations for different types of radiation inside and outside the body.

20. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. **SO1**: to be able to identify core concepts of medical physics and the physics principles in medical radiation therapy and different applications in medical physics.
2. **SO2**: to be able to develop design, hypothesize, and conduct scientific research in medical physics.
3. **SO3**: to be able to apply mathematical and analytical skills to solve problems, interpret diagnostic data, and test hypotheses in medical physics.
4. **SO4**: to be able to recognize and uphold ethical, social, and legal responsibilities in medical physics practice.

5. **SO5**: to be able to use computational tools to analyze data and demonstrate competency with medical diagnostic instruments.
6. **SO6**: to be able to function effectively independently and on teams for establishing goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

21. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Understand the necessity of radiation protection by analyzing the energy transfer mechanisms and potential biological injuries caused by radiation.
2. Differentiate between directly and indirectly ionizing particles, including Beta particles, positrons, alpha particles, protons, gamma rays, and neutrons, based on their properties, interactions, and shielding methods.
3. Explain the behavior and attenuation of Gamma rays using penetration energies, attenuation coefficients, and dose reduction techniques.
4. Identify the characteristics and interactions of neutrons with matter, including sources, collision mechanisms, and attenuation strategies.
5. Calculate absorbed doses and dose equivalents using concepts such as the rad, Gray, rem, and Sievert, while understanding the implications of these units for radiation protection.
6. Assess the risks of internal radiation exposure by evaluating radioactive activity, maximum permissible concentrations, and contamination control techniques.
7. Evaluate X-ray production, diagnostic applications, and safety measures, focusing on energy distribution, attenuation effects, and shielding practices for patients and workers.
8. Perform dose calculations for Beta-emitting radionuclides, including initial dose rates, effects of radioactive decay and biological elimination, and absorbed dose functions.

9. Compute absorbed doses from Gamma emitters, considering point sources, distributed sources, and targets outside the source volume.
10. Conduct dose evaluations for specific radionuclides such as Hydrogen-3, Iodine-131, Iodine-125, Strontium-90, Xenon-133, Krypton-85, Uranium-238, and Radon-222 in various scenarios, including nuclear medicine applications.
11. Apply radiation protection principles to practical scenarios by integrating dose calculations with knowledge of particle properties, energy distributions, and shielding techniques.

Course ILOs	The learning levels to be achieved					
	Remembering	Understanding	Applying	Analysing	evaluating	Creating
1	✓	✓				
2	✓	✓		✓		
3	✓	✓	✓			
4	✓	✓	✓			
5		✓	✓	✓		
6		✓	✓	✓		
7		✓	✓		✓	
8	✓		✓			
9	✓		✓			
10	✓		✓	✓		
11		✓	✓	✓		

٢٢. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program ILOs / Course ILOs	ILO (1)	ILO (2)	ILO (3)	ILO (4)	ILO (5)	ILO (6)
1	✓		✓	✓		
2	✓		✓			
3	✓		✓			
4	✓		✓			
5	✓		✓			
6	✓	✓	✓	✓		
7	✓		✓	✓	✓	
8	✓	✓	✓		✓	
9	✓	✓	✓		✓	
10	✓	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓	✓

٢٣. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1	The need for radiation protection and Energy and injury	ILO (1), ILO (4)	Face to Face	Classroom	Synchronous	Participation, Discussion	Radiation Protection, 4th Ed.
2	2	Directly and indirectly ionizing particles	ILO (1), ILO (3)	Face to Face	Classroom	Synchronous	Participation, Problem Solving	Radiation Protection, 4th Ed.
3	3	Beta particles: Properties, radionuclides, and protection	ILO (1), ILO (3)	Face to Face	Classroom	Synchronous	Problem Solving	Radiation Protection, 4th Ed.

4	4	Indirectly ionizing particles and Gamma rays: Energies and attenuation	ILO (1), ILO (3)	Face to Face	Classroom	Synchronous	Participation, Problem Solving	Radiation Protection, 4th Ed.
5	5	Additional directly ionizing particles: Positrons, alpha particles, and protons	ILO (1), ILO (3)	Face to Face	Classroom	Synchronous	Quiz	Radiation Protection, 4th Ed.
6	6	Neutrons: Sources, collision, and attenuation	ILO (1), ILO (3)	Face to Face	Classroom	Synchronous	Midterm Exam	Radiation Protection, 4th Ed.
7	7	Absorbed dose and dose equivalent	ILO (1), ILO (3)	Face to Face	Classroom	Synchronous	Participation	Radiation Protection, 4th Ed.

8	8	Internal radiation exposure and contamination control	ILO (1), ILO (4)	Face to Face	Classroom	Synchronous	Problem Solving	Radiation Protection, 4th Ed.
9	9	X-rays: Production, diagnostic applications, and safety	ILO (1), ILO (3), ILO (5)	Face to Face	Classroom	Synchronous	Quiz	Radiation Protection, 4th Ed.
10	10	Dose from Beta-emitting radionuclides	ILO (3), ILO (5)	Face to Face	Classroom	Synchronous	Problem Solving	Radiation Protection, 4th Ed.
11	11	Calculation of absorbed dose from Gamma emitters	ILO (3), ILO (5)	Face to Face	Classroom	Synchronous	Participation	Radiation Protection, 4th Ed.

12	12	Dose calculations for specific radionuclides (Hydrogen-3, Iodine-131, etc.)	ILO (3), ILO (5)	Face to Face	Classroom	Synchronous	Quiz	Radiation Protection, 4th Ed.
13	13	Radiation doses in nuclear medicine	ILO (1), ILO (3), ILO (5)	Face to Face	Classroom	Synchronous	Final Exam	Radiation Protection, 4th Ed.
14	14	Practical applications of radiation protection principles	ILO (1), ILO (3), ILO (4), ILO (6)	Face to Face	Classroom	Synchronous	Project Evaluation	Radiation Protection, 4th Ed.
15	15	Course review and discussion	All ILOs	Face to Face	Classroom	Synchronous	Participation	Radiation Protection, 4th Ed.

٢٤. Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	ILO/s Linked to the Evaluation activity	Period (Week)	Platform

٢٥. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):

N/A

٢٦. Course Policies:

A- Attendance policies: According to JU by-laws.

B- Absences from exams and submitting assignments on time: According to JU by-laws.

C- Health and safety procedures: N/A

D- Honesty policy regarding cheating, plagiarism, misbehavior: According to JU by-laws.

E- Grading policy: According to JU by-laws.

F- Available university services that support achievement in the course: N/A

2٧. References:

A- Required book(s), assigned reading and audio-visuals:

Radiation Protection, A Guide for Scientists, Regulators and Physicians,

4th Edition Jacob Shapiro.

Harvard University Press.

B- Recommended books, materials, and media:

2٨. Additional information:

Name of the Instructor or the Course Coordinator: Prof.Issa Al-Shakhrah	Signature: Al-Shakhrah	Date: 14 Jan. 2025
Name of the Head of Quality Assurance Committee/ Department ……	Signature: ……	Date: ……
Name of the Head of Department ……	Signature: ……	Date: ……
Name of the Head of Quality Assurance Committee/ School or Center ……	Signature: ……	Date: ……
Name of the Dean or the Director ……	Signature: ……	Date: ……