مركز الاعتماد وضمان الجودة
ACCREDITATION & QUALITY ASSURANCE CENTER

Course Syllabus

1	**Course title**	Radiation Physics
2	**Course number**	0302265
3	**Credit hours**	3 (theory)
	Contact hours (theory, practical)	3
4	**Prerequisites/corequisites**	Physics 0302101 & Physics 0302102
5	**Program title**	BSc
6	**Program code**	
7	**Awarding institution**	The University of Jordan
8	**School**	Science
9	**Department**	Physics
10	**Course level**	200
11	**Year of study and semester(s)**	1st semester, 2022-2023
12	**Other department(s) involved in teaching the course**	None
13	**Main teaching language**	English
14	**Delivery method**	x☐Face to face learning ☐Blended ☐Fully online
15	**Online platforms(s)**	☐Moodle x☐Microsoft Teams ☐Skype ☐Zoom ☐Others……
16	**Issuing/Revision Date**	9/10/2022

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17 Course Coordinator:

Name: Prof. Jamal Sharaf	Contact hours: Sun, Tue & Thursday 11:00 – 12:30
Office number: M 220	Phone number: Ex, 22056
Email:j_sharaf@ju.edu.jo	

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.

Radiation sources, interactions and energy deposition by ionizing radiation in matter; concepts, quantities and units in radiation physics. Isotope production, measurement of activity, standards, Spectrometry, measurement techniques and detectors. Precision, errors, detection limits. Radioanalytical methods. Principles and methods of radiation dosimetry. Radiation detection instrumentation.

20 Course aims and outcomes:

A – Aims: Understanding the fundamental of radiation physics including the production of ionizing radiation and its interaction with matter as well as discussing topics in radiation dosimetry, instrumentation, applications and radiation protection.

B - Students Learning Outcomes (SLOs):

SLO (1) Identify radiation types, production and sources, explaining the nature of ionizing radiation and how it is measured and monitored.

SLO (2) Understand cell biology and the effects of radiation on it. Recognize molecular and cellular radiation biology, identifying early and late radiation effect and how it can relate to genetics.

SLO (3) Describe radiation energy transfer, radiation effects, and radio sensitivity and response.

SLO (4) Define dose limits, equipment design, and management of radiation dose. Along with the units, detection and measurement of radiation.

SLO (5) Understand the need and objectives of a radiation protection plan and radiation safety.

SLO (6) Understand the application of radiation in medicine and industry.

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

Program SLOs / Course SLOs	SLO (1)	SLO (2)	SLO (3)	SLO (4)	SLO (5)	SLO (6)	SLO (7)	SLO (8)	SLO (9)
1. Identify radiation types, production and sources, explaining the nature of ionizing radiation and how it is measured and monitored.	✓				✓				
2. Understand cell biology and the effects of radiation on it. Recognize molecular and cellular radiation biology, identifying early and late radiation effect and how it can relate to genetics	✓				✓				
3. Describe radiation energy transfer, radiation effects, and radio sensitivity and response.		✓	✓						
4. Define dose limits, equipment design, and management of radiation dose. Along with the units, detection and measurement of radiation.		✓	✓						
5. Understand the need and objectives of a radiation protection plan and radiation safety.						✓			✓
6. Understand the application of radiation in medicine and industry.					✓	✓			

Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to demonstrate the understanding of:

1. Radiation concepts,
2. Radiation detection, monitoring, and measurement,
3. Biological effects of radiation and dosimetry,
4. Application of radiation in medicine and industry

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21. Topic Outline and Schedule:

Week	Lecture	Topic	Intended Learning Outcome	Learning Methods (Face to Face/Blended/ Fully Online)	Platform	Synchronous / Asynchronous Lecturing	Evaluation Methods	Resources
1	1.1	Radiation sources		Face to Face			Written exams	
	1.2	Natural radioactive						
	1.3	General properties of alpha, beta and gamma rays						
2	2.1	Interaction of charged particles with Matter						
	2.2	Energy transfer mechanisms						
	2.3	Scattering, excitation and ionisation						
3	3.1	Range-energy relationship						
	3.2	Interaction of X- and gamma rays with matter						
	3.3	Aattenuation and mass energy absorption						

		coefficients						
4	4.1	Interaction of neutrons with matter						
	4.2	Electrically produced radiation: X-ray tube and Particle accelerators						
	4.3	Filtration and beam quality						
5	5.1	Radiation detection and measurement						
	5.2	Gas Filled detectors						
	5.3	scintillation detectors						
6	6.1	semiconductor detectors						
	6.2	Gamma ray spectrometers NAI(Tl)						
	6.3	Gamma ray spectrometers HPGe						
7	7.1	Neutron detectors						
	7.2	Radiation Measuring & Monitoring Instruments						
	7.3	Thermoluminescent						

		Dosimeters (TLD)						
8	8.1	Radiation biology						
	8.2	Stochastic and deterministic effects of radiation						
	8.3	Radiation Quantities and Units						
9	9.1	External radiation hazards,						
	9.2	Shielding calculation parameters						
	9.3	Internal radiation hazards,						
10	10.1	Protective measures to reduce radiation exposures						
	10.2	Radiation dosimetry						
	10.3	Absorbed dose, Kerma & exposure						
11	11.1	Equivalent dose &Effective dose						
	11.2	Effective dose						

		calculations						
	11.3	Dosimetry of point source						
12	12.1	Neutron dosimetry						
	12.2	Basic concepts of radiation protection standards						
	12.3	Natural radioactivity in the environment and manmade sources						
13	13.1	Dose to individuals from natural radioactivity and manmade sources						
	13.2	Categories of exposures & risk factors						
	13.3	Dose limits for occupational workers, trainees and general public						
14	14.1	Principles of Diagnostic Radiology						
	14.2	X-ray Imagining						

		Devices						
	14.3	X-ray Imaging Techniques						
15	15.1	Final Exam						
	15.2	--------						
	15.3	----------						

22 Evaluation Methods:

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

Evaluation Activity	Mark	Topic(s)	SLOs	Period (Week)	Platform
First Exam	25%	L 1.1 – L 4.3	SLO 1,2,3,5	Week 5	Face to Face
Second Exam	25%	L 5.1 – L 10.1	SLO 6, 9	Week 11	=
Final Exam	%0%	All Topics	SLO 1,2,3,5 6, 9	Week 15	=

23 Course Requirements

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

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24 Course Policies:

A- Attendance policies: Regular attendance at all learning activities is expected, and unsatisfactory attendance may lead to disciplinary action according to the University of Jordan regulations.

B- Absences from exams and submitting assignments on time: Students may be permitted to make up an exam missed due to illness or other legitimate absence. A doctor's certification before allowing a student to make up an exam due to illness is required.

C- Health and safety procedures:-----

D- Honesty policy regarding cheating, plagiarism, misbehavior: The University Of Jordan policy will be implemented

E- Grading policy: First exam: 25%

Second exam: 25%

Final exam: 50%

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

25 References:

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

Atoms, Radiation and Radiation Protection, 3rd edition,

2007, by **James E. Turner**.

B- Recommended books, materials, and media:

Introduction to Health Physics, 3rd edition, 1996, by

Herman Cember.

Radiation Detection and Measurements, 2nd edition, 1989,

by **Knoll.**

26 Additional information:

Name of Course Coordinator: Prof. Jamal Sharaf Signature: ---------- Date: 9/10/2022
Head of Curriculum Committee/Department: ---------- Signature: ----------
Head of Department: ---------- Signature: ----------
Head of Curriculum Committee/Faculty: ---------- Signature: ----------
Dean: ---------- Signature: ----------