

Course Syllabus

1	Course title	Nuclear and Radiochemistry	
2	Course number	0333323	
3	Credit hours	3	3
	Contact hours (theory, practical)	3 week	
4	Prerequisites/corequisites	Chemistry 102	
5	Program title	BSc	
6	Program code	3	
7	Awarding institution	The University of Jordan	
8	School	Science	
9	Department	Chemistry Department	
10	Course Level	Third year	
11	Year of study and semester (s)	Summer semester 2023/2024	
12	Other department (s) involved in teaching the course		
13	Main teaching language	Mixed English with Arabic	
14	Delivery method	<input type="checkbox"/> Blended <input checked="" type="checkbox"/> Online	
15	Online platforms(s)	Teams	
16	Issuing/Revision Date	8/7/2024	

17 Course Coordinator:

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Phone number: 22142

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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:

This course will ensure that students become conversant with the following main aspects of chemistry:

Major aspects of nuclear and radiochemical terminology, nomenclature, conventions and units.

The major types of nuclear stability, nuclear and radiochemical reactions and decay and the main characteristics associated with them.

Equations of radioactive growth and decay and transformations during nuclear reactions.

The principles and procedures used in nuclear and radiochemical analysis and the characterization of nuclear and radiochemical compounds.

The characteristics of the different methods of interactions of radiations with matter and the theories used to describe them.

The principles and types of nuclear detection instruments.

stated in the approved study plan.

The principles of nuclear energy

20 Course aims and learning outcomes (CLOs):

To install in students a sense of enthusiasm for nuclear chemistry, an appreciation of its application in different contexts and to involve them in an intellectually stimulating and satisfying experience of learning and studying.

CLO1_ To provide students with a broad and balanced foundation of nuclear chemical knowledge and practical skills.

CLO2_ To develop in students the ability to apply their nuclear chemical knowledge and skills to the solution of theoretical and practical problems in nuclear and radiochemistry.

CLO3_ To develop in students, through an education in nuclear and radiochemistry, a range of transferable skills, of value in chemical and non-chemical employment.

CLO4_ To provide students with a knowledge and skills base from which they can proceed to further studies in specialized areas of nuclear and radiochemistry or multi-disciplinary areas involving nuclear and radiochemistry.

CLO5_ To generate in students an appreciation of the importance of nuclear and radiochemistry in an industrial, economic, environmental and social context.

B- Students Learning Outcomes (SLOs):

SLO 1 Major aspects of nuclear and radiochemical terminology, nomenclature, conventions and units.

SLO 2 The major types of nuclear stability, nuclear and radiochemical reactions and decay and the main characteristics associated with them.

SLO 3 Equations of radioactive growth and decay and transformations during nuclear reactions.

SLO 4 The principles and procedures used in nuclear and radiochemical analysis and the characterization of nuclear and radiochemical compounds.

SLO 5 The characteristics of the different methods of interactions of radiations with matter and the theories used to describe them.

SLO 6 The principles and types of nuclear detection instruments.

SLO 7 The principles of nuclear energy

0333323 Nuclear and Radiochemistry

		Student Outcomes (SO)						
		SLO -1	SLO -2	SLO -3	SLO -4	SLO -5	SLO -6	SLO -7
Course Learning Outcomes (CLO)	CLO-1	✓	✓					
	CLO-2	✓	✓	✓				
	CLO-3	✓		✓				
	CLO-4	✓	✓	✓	✓	✓	✓	✓
	CLO-5	✓	✓	✓	✓	✓	✓	✓

21. Topic Outline and Schedule:

Week	Lecture	Topic	Teaching Methods*/platform	Evaluation Methods**	References
1	1.1	Introduction	online	1st exam	Nuclear and radiochemistry By F Khalili
	1.2				
	1.3	Radioactive decay			
	1.4				
	1.5	Cosmic ray			
2	2.1	Atomic structure			
	2.2				
	2.3	Isotopes			
	2.4				
	2.5	Nuclear stability			
3	3.1	Mass defect			
	3.2				
	3.3	Semiempirical Binding energy equation		1st exam	
	3.4				
	3.5	Mass Parabola		2nd exam	
4	4.1	Conservation laws			

	4.2				
	4.3	Alpha decay			
	4.4				
	4.5	Beta decay			
5	5.1	Gamma decay	online		
	5.2				
	5.3	Spontaneous fission			
	5.4				
	5.5	Decay schemes			
6	6.1	Closed energy cycle			
	6.2				
	6.3	Equation of decay			
	6.4				
	6.5	Average life			
7	7.1	Decay of mixtures			
	7.2				
	7.3	Growth of products			
	7.4				
	7.5	Secular equilibrium			
8	8.1	Successive decay			
	8.2				

	8.3	<u>Units of radioactivity</u>			
	8.4				
	8.5	Interaction of radiation with matter			
9	9.1	Range			
	9.2				
	9.3	Stopping power	online		
	9.4				
	9.5	Range energy relation		2 nd exam	
10	10.1	Electrons			
	10.2				
	10.3	<u>Gama ray</u>			
	10.4				
	10.5	Pair production			
11	11.1	X- ray			
	11.2				
	11.3	<u>Radiation protction</u>			
	11.4				
	11.5	Internal radiation sources			
12	12.1	Nuclear energy			
	12.2				
	12.3	<u>Nuclear reactor</u>			
	12.4				

	12.5	Energy in fission			
13	13.1	Nuclear fission			
	13.2				
	13.3	<u>Fission models</u>			
	13.4				
	13.5	Oklo phenomenon			
14	14.1	Radioactive wastes			
	14.2		online		
	14.3	<u>Solid wastes</u>			
	14.4				
	14.5	Nuclear bombs	online	Final exam including all chapters	

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
1st exam	30%	Introduction, Radioactive decay, Cosmic ray, Atomic structure, Isotopes, Nuclear stability, Mass defect, Semiempirical binding energy	SLO -1 SLO -2 SLO -3	Three weeks	In the department

		equation, Mass Parabola, conservation laws, Alpha decay			
Mid exam	30%	Beta decay, Gamma decay, Spontaneous fission, Decay schemes, Closed energy cycle, Equation of decay, Average life, Decay of mixtures, Growth of products, Secular equilibrium, Successive decay, Units of radioactivity, Interaction of radiation with matter, Range, Stopping power, Range energy relation	SLO -3 SLO -4 SLO -5	Three weeks	In the department
Final exam	40%		SLO -1 to 7	Seven weeks	In the department

23 Course Requirements

students should have a computer, internet connection, webcam and an account on a Microsoft Teams software/platform.

24 Course Policies:



A- Attendance policies: A- Attendance policies:

A maximum of 15% absence is allowed.

B- Absences from exams:

Incomplete Exams are conducted later after arranging a new date.

C- Health and safety procedures:

This is a theoretical course.

D- Honesty policy regarding cheating, plagiarism, and misbehavior:

The general Jordan University's laws are applied in any case of cheating.

E- Grading policy:

The letters scale is applied.

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

Free Internet access and E-learning.

25 References:

A-- Nuclear and radiochemistry (Arabic) 2nd

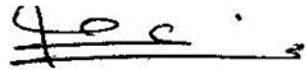
By F. Khalili

B- Recommended books, materials and media:

- Nuclear and radiochemistry 3rd

By G. Friedlander, J. W. Kennedy, E. S. Macias, J. M. Miller B- Recommended books, materials, and media:

26 Additional information:

Name of Course Coordinator: Fawwaz I. Khalili Date: 8/7/2024	Signature: 
Head of Curriculum Committee/Department: ----- -----	Signature: -----
Head of Department: ----- -----	Signature: -----
Head of Curriculum Committee/Faculty: ----- -----	Signature: -----
Dean: ----- -----	Signature: -----