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	
	Deans Council Approval Decision Number	2/3/24/2023
	The Date of the Deans Council Approval Decision	23/01/2023
	Number of Pages	06

1.	**Course Title**	Radiation Biology
2.	**Course Number**	0302776
3.	**Credit Hours (Theory, Practical)**	3 Credit Hours (Theory)
	Contact Hours (Theory, Practical)	3 Theory
4.	**Prerequisites/ Corequisites**	0342765 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: 3hrs

Office number:015 Phone number: 22058

Email: issashak@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. Some properties of ionizing radiation; the effect of radiation at the molecular and sub cellular levels; cellular effects of radiation; radiation cell survival in Vivo; The effect of radiation at the tissue level; genetic effects of ionizing radiation; physical, biological and chemical factors which modify the biological effect of radiation. radiation and cancer.

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. Explain the physical, chemical, and biological changes caused by ionizing radiation, including dose, dose rate, and dose distribution.

2. Evaluate the effects of radiation on proteins, nucleic acids, and DNA, including DNA damage, repair mechanisms, and effects on synthesis and division.

3. Analyze cellular responses to radiation, including cell survival curves, the radiosensitivity of cell cycle phases, and repair mechanisms.

4. Compare radiation effects on cells in vitro and in vivo, including tumor dose-response relationships and 3D culture systems.

5. Evaluate tissue radiosensitivity, modes of death from whole-body radiation, and effects on critical organ systems, including the nervous, gastrointestinal, and hematopoietic systems.

6. Assess the genetic impact of radiation, including hereditary mutations and effects on reproduction and development.

7. Analyze physical, biological, and chemical factors that influence the biological effects of radiation.

8. Examine the role of ionizing radiation in cancer development, including mechanisms of carcinogenesis.

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

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	✓	✓	✓			

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	1.1	Introduction to ionizing radiation and its properties	1	Face-to-Face	Classroom	Synchronous	Class discussion , quiz	Biological Effects of Radiation, J.E. Coggle (1983)
1	1.2	Dose, dose rate, and dose distribution	1	Face-to-Face	Classroom	Synchronous	Problem-solving	Biological Effects of Radiation, J.E. Coggle (1983)
1	1.3	Physical, chemical, and biological changes after radiation absorption	1	Face-to-Face	Classroom	Synchronous	Assignment	Biological Effects of Radiation, J.E. Coggle (1983)

2	**2.1**	**Radiation effects on proteins**	**2**	**Face-to-Face**	**Classroom**	**Synchronous**	**Class discussion**	**Biological Effects of Radiation, J.E. Coggle (1983)**
2	**2.2**	**Radiation-induced DNA damage and repair mechanisms**	**2**	**Face-to-Face**	**Classroom**	**Synchronous**	**Quiz**	**Biological Effects of Radiation, J.E. Coggle (1983)**
2	**2.3**	**Effects on DNA synthesis and division delay**	**2**	**Face-to-Face**	**Classroom**	**Synchronous**	**Assignment**	**Biological Effects of Radiation, J.E. Coggle (1983)**
3	**3.1**	**Cellular responses to radiation: Cell survival curves**	**3**	**Face-to-Face**	**Classroom**	**Synchronous**	**Problem-solving**	**Biological Effects of Radiation, J.E. Coggle (1983)**

3	3.2	Radiosensitivity of different cell cycle phases	3	Face-to-Face	Classroom	Synchronous	Class discussion , quiz	Biological Effects of Radiation, J.E. Coggle (1983)
3	3.3	Repair mechanisms following radiation exposure	3	Face-to-Face	Classroom	Synchronous	Quiz	Biological Effects of Radiation, J.E. Coggle (1983)
4	4.1	Radiation effects on cells in vitro	4	Face-to-Face	Classroom	Synchronous	Presentation, quiz	Biological Effects of Radiation, J.E. Coggle (1983)
4	4.2	Radiation effects on cells in vivo	4	Face-to-Face	Classroom	Synchronous	Class discussion	Biological Effects of Radiation, J.E. Coggle (1983)

4	4.3	Tumor dose-response relationships	4	Face-to-Face	Classroom	Synchronous	Problem-solving	Biological Effects of Radiation, J.E. Coggle (1983)
5	5.1	Tissue radiosensitivity	5	Face-to-Face	Classroom	Synchronous	Assignment	Biological Effects of Radiation, J.E. Coggle (1983)
5	5.2	Modes of death from whole-body radiation	5	Face-to-Face	Classroom	Synchronous	Midterm exam	Biological Effects of Radiation, J.E. Coggle (1983)
5	5.3	Effects on critical organ systems	5	Face-to-Face	Classroom	Synchronous	Class discussion	Biological Effects of Radiation, J.E. Coggle (1983)

6	6.1	Genetic impact of radiation	6	Face-to-Face	Classroom	Synchronous	Quiz	Biological Effects of Radiation, J.E. Coggle (1983)
6	6.2	Hereditary mutations and their mechanisms	6	Face-to-Face	Classroom	Synchronous	Problem-solving	Biological Effects of Radiation, J.E. Coggle (1983)
6	6.3	Radiation effects on reproduction and development	6	Face-to-Face	Classroom	Synchronous	Assignment	Biological Effects of Radiation, J.E. Coggle (1983)
7	7.1	Factors influencing biological effects of radiation	7	Face-to-Face	Classroom	Synchronous	Quiz	Biological Effects of Radiation, J.E. Coggle (1983)

7	7.2	Physical and chemical factors	7	Face-to-Face	Classroom	Synchronous	Class discussion	Biological Effects of Radiation, J.E. Coggle (1983)
7	7.3	Biological factors	7	Face-to-Face	Classroom	Synchronous	Problem-solving	Biological Effects of Radiation, J.E. Coggle (1983)
8	8.1	Radiation and cancer: Mechanisms of carcinogenesis	8	Face-to-Face	Classroom	Synchronous	Assignment	Biological Effects of Radiation, J.E. Coggle (1983)
8	8.2	Cancer development and radiation-induced mutations	8	Face-to-Face	Classroom	Synchronous	Class discussion	Biological Effects of Radiation, J.E. Coggle (1983)

8	**8.3**	**Radiation therapy and cancer treatment**	**8**	**Face-to-Face**	**Classroom**	**Synchronous**	**Final exam**	**Biological Effects of Radiation, J.E. Coggle (1983)**

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:

Biological Effects of Radiation, J. E. Coggle.

International Publications Services, Taylor and Francis Inc.,

New York, Second edition 1983.

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:
……	……...……	……..……