Republic of Yemen

Ministry of Education & Higher Research

Council of Academic Accreditation & Quality Assurance of

Higher Education (CAQA)

21 septamber University of Medical and Applied Science

Faculty of Applied Medical Science

Department of Medical Radiology and Imaging Technology

Program of Radiologic Technology and Medical Imaging

Course Specification of

Radiation Protection

Course Code. (____)

2024

T4: This Template is Developed and Approved by CAQA-Yemen, 2023

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
	Dr. -----	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulsalam Dalaq

I. General Information:

1.	Course Title:	Radiation Protection				
2.	Course Code:					
3.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours	
			Lecture	Tutorial/ Seminar	Lab	Clinical
		3	2	--	2	--
4.	Level/ Semester at which this Course is offered:	2nd Level / 1st Semester				
5.	Pre –Requisite (if any):	Radiation Physics				
6.	Co –Requisite (if any):	None				
7.	Program (s) in which the Course is Offered:	Bachelor of Radiologic Technology and Medical Imaging				
8.	Language of Teaching the Course:	English				
9.	Location of Teaching the Course:	Faculty of Applied Medical Science				
10.	Prepared by:					
11.	Date and Number of Approval by Council:					

II. Course Description:

This course covers the principles and practices of radiation protection in medical imaging. Topics include the biological effects of ionizing radiation, radiation exposure limits, dose reduction strategies, radiation safety regulations, and practical applications in radiologic technology. The course aims to equip students with the knowledge and skills necessary to ensure safety in the use of radiation in medical settings.

III. Course Intended Learning Outcomes (CILOs) : Upon successful completion of the course, students will be able to:			Referenced PILOs	
A. Knowledge and Understanding:		**I, P or M/A**		
a1	Understand the principles of radiation protection and safety.	**A**	**A2**	Explanation the principles and procedures of medical imaging acquisitions, medical imaging technique and Radiological Technology Sciences as well as patient positioning in computed radiography and MRI technique.
a2	Recognize the biological effects of ionizing radiation on human tissues.	**A**	**A1**	Demonstrate an understanding of fundamental knowledge of Biomedical sciences (Biology, Biophysics, Anatomy, Physiology, Sectional anatomy and medical imaging technique).
B. Intellectual Skills:				
b1	Analyze radiation dose measurements and apply dose reduction techniques.	**A**	**B1**	Assess the radiation exposure times and intensity of exposure to guarantee the imaging technique is accurate to reduce the risk factors and adapt to patient needs.
b2	Evaluate compliance with radiation safety standards and regulations.	**A**	**B2**	Devising solutions for positioning and instructing people throughout a procedure, as well as using the radiation safety protocols
C. Professional and Practical kills:				
c1	Implement radiation protection measures in clinical practice.	**M**	**C1**	Execute quality management system and standard procedures in radiological technology practice.
c2	Use radiation monitoring devices effectively.	**M**	**C2**	Apply technical skills in using medical imaging devices, tools, and materials in radiological technology practice.

D. Transferable Skills:				
d1	Implement radiation protection measures in clinical practice.	**A**	**D1**	Communicate effectively with clinicians, patients, and support staff.
d2	Use radiation monitoring devices effectively.	**A**	**D4**	Function effectively as an individual, as a member, or leader of a team engaged in appropriate activities to the radiologic technology disciplines to accomplish a common goal.
I= Introduced, P=Practiced or M/A= Mastered/Advanced				

(A) Alignment of Course Intended Learning Outcomes (Knowledge and Understanding) to Teaching Strategies and Assessment Methods:

	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
a1	Understand the principles of radiation protection and safety.	▪ Lectures, readings	▪ Written exams, quizzes
a2	Recognize the biological effects of ionizing radiation on human tissues.	▪ Lectures, case studies	▪ Written exams, assignments

(B) Alignment of Course Intended Learning Outcomes (Intellectual Skills) to Teaching Strategies and Assessment Methods:

	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
b1	Analyze radiation dose measurements and apply dose reduction techniques.	▪ Problem-based learning, labs	▪ Written exams, Practical exams, projects
b2	Evaluate compliance with radiation safety standards and regulations.	▪ Group discussions, case studies	▪ Written exams, Assignments, presentations

(C) Alignment of Course Intended Learning Outcomes (Professional and Practical Skills) to Teaching Strategies and Assessment Methods:

	Course Intended Learning Outcomes	Teaching Strategies	Assessment Strategies
c1	Implement radiation protection measures in clinical practice.	▪ Practical labs, simulations	▪ Practical exams, lab reports
c2	Use radiation monitoring devices effectively.	▪ Hands-on training	▪ Lab reports, practical exams

(D) Alignment of Course Intended Learning Outcomes (Transferable Skills) to Teaching Strategies and Assessment Methods:			
Course Intended Learning Outcomes		**Teaching Strategies**	**Assessment Strategies**
d1	Implement radiation protection measures in clinical practice.	▪ Role-playing, presentations	▪ Presentations
d2	Use radiation monitoring devices effectively.	▪ Case studies, problem-solving	▪ Case study reports

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	**Introduction to Radiation Protection**	– History, Principles, Units of Measurement	1	2	a1, a2
2	**Biological Effects of Radiation**	– DNA Damage, Cell Death, Acute and Chronic Effects	1	2	a2, b1
3	**Radiation Dose Measurement and Units**	– Absorbed Dose, Equivalent Dose, Effective Dose	1	2	a1, b1
4	**Radiation Exposure Limits and Regulations**	– International Standards, National Regulations	1	2	a2, b2
5	**Radiation Protection Principles**	– Time, Distance, Shielding	1	2	a1, b1, c1
6	**Dose Reduction Strategies in Imaging**	– ALARA Principle, Technological Advances	1	2	a2, b1, c1
7	**Radiation Protection in Diagnostic Radiology**	– Radiographic Procedures, Fluoroscopy, CT	1	2	a1, c1
8	**Mid-Term Exam**	– In all previous Topics	1	2	a1, a2, b1
9	**Radiation Protection in**	– Radionuclide Handling, Patient Safety	1	2	a1, c1

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
	Nuclear Medicine				
10	**Radiation Protection in Radiotherapy**	– Treatment Planning, Shielding Design	1	2	a1, c1
11	**Radiation Monitoring and Dosimetry**	– Personal Dosimeters, Area Monitors	1	2	a2, c2
12	**Emergency Procedures and Radiation Incidents**	– Spill Management, Incident Reporting	1	2	a1, c1, d2
13	**Patient Education and Communication**	– Risk Communication, Informed Consent	1	2	d1, d2
14	**Radiation Safety Program Management**	– Policy Development, Staff Training	1	2	b2, d2
15	**Recent Advances and Future Directions**	– Emerging Technologies, Research Trends	1	2	a2, b1, d2
16	**Final Theoretical Exam**	– All theoretical topics	1	2	a1, a2, b1, b2, c1, c2
Number of Weeks /and Units Per Semester			**16**	**32**	

B. Practical Aspect (Lab/Clinical) (if any):

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	Measuring Radiation Dose with Personal Dosimeters	1	2	b1, c2
2	Evaluating Shielding Effectiveness in Radiology	1	2	b1, c1
3	Simulating Radiation Incidents and Response	1	2	a1, c1, d2
4	Case Study: Radiation Protection in Fluoroscopy	1	2	a1, b1, c1

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
5	Analysis of Dose Reduction Techniques in CT Imaging	1	2	a2, b1
6	Radiological Safety in Nuclear Medicine Procedures	1	2	a1, c1
7	Developing a Radiation Safety Protocol	1	2	b2, d2
8	Hands-on Training with Radiation Monitoring Equipment	1	2	c2, d2
9	Communication Skills for Radiation Risk Management	1	2	d1, d2
10	Assessing Compliance with Radiation Safety Standards	1	2	b2, c1
15	Final Practical Exam	1	2	b1, c2
Number of Weeks /and Units Per Semester		**14**	**28**	

C. Tutorial Aspect (if any):

No.	Tutorial	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	**None**			
2				
3				
Number of Weeks /and Units Per Semester				

VII. Teaching Strategies:

- **Lectures, readings**
- **Group discussions,**
- **case studies**
- **Problem-based learning,**
- **Practical labs, simulations**
- **Hands-on training**
- **Role-playing, presentations**
- **problem-solving**

VII. Assessment Methods:

- Written Exams
- Quizzes
- Practical Exams
- Assignments
- Projects
- Presentations

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1	Research Paper on Radiation Safety Protocols	5	3	b2, d2
2	Case Study Analysis	7	3	a1, c1
3	Practical Report on Dosimetry Measurement	9	2	b1, c2
4	Group Presentation on Radiation Incidents	11	2	a1, d1
Total			10	

VIII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1	Midterm Written Exam	6	10	10%	a1, a2
2	Final Practical Exam	15	30	30%	b1, c2
3	Assignments	Ongoing	10	10%	a1, a2, b2, c2, d2
4	Final Written Exam	16	50	50%	a1, a2, b1, b2
Total			100	100 %	

IX. Learning Resources:

1- Required Textbook(s) (maximum two):
1. Mary Alice Statkiewicz Sherer, Paula J. Visconti, E. Russell Ritenour, Kelli Welch Haynes, 2017, Radiation Protection in Medical Radiography, Elsevier Health Sciences. 2. Steve Forshier, 2012, Essentials of Radiation, Biology and Protection, Cengage Learning.
2- Essential References:
1. Eric J. Hall, Amato J. Giaccia, 2006, Radiobiology for the Radiologist, Lippincott Williams & Wilkins 2. ICRP (International Commission on Radiological Protection) publications. 3. NCRP (National Council on Radiation Protection & Measurements) reports.
3- Electronic Materials and Web Sites etc.:
Electronic Materials and Websites ○ International Atomic Energy Agency (IAEA) Radiation Protection. ○ Health Physics Society

X. Course Policies: (Based on the Uniform Students' By law (2007)

1	**Class Attendance:** Class Attendance is mandatory. A student is considered absent and shall be banned from taking the final exam if his/her absence exceeds 25% of total classes.
2	**Tardiness:** A student will be considered late if he/she is not in class after 10 minutes of the start time of class.
4	**Assignments & Projects:** Assignments and projects must be submitted on time. Students who delay their assignments or projects shall lose the mark allocated for the same.
5	**Cheating:** Cheating is an act of fraud that results in the cancelation of the student's exam or assignment. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply.
6	**Forgery and Impersonation:** Forgery/Impersonation is an act of fraud that results in the cancelation of the student's exam, assignment or project. If it takes place in a final exam, the penalties stipulated for in the Uniform Students' Bylaw (2007) shall apply**.**
7	**Other policies:** The University official regulations in force will be strictly observed and students shall comply with all rules and regulations of the examination set by the Department, Faculty and University Administration.
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الجمهورية اليمنية
وزارة التربية والتعليم والبحث العلمي
جامعة 21 سبتمبر للعلوم الطبية والتطبيقية
كلية التكنولوجيا الطبية

Faculty of Applied Medical Science

Department of Medical Radiology and Imaging Technology

Program of Radiologic Technology and Medical Imaging

Course Plan (Syllabus) of

Radiation Protection

Course Code. .....

I. Information about Faculty Member Responsible for the Course:								
Name of Faculty Member:		**Office Hours**						
Location& Telephone No.:	-----							
E-mail:	--@--.--	SAT	SUN	MON	TUE	WED	THU	

2024/2025

Prepared by:	Reviewed by:	Head of the Department:	Quality Unit:	Dean:
	Dr. -----	Dr. Awadh Al-Kubati	Dr. Mohammed Al-shamahi	Dr. Abdulsalam Dalaq

I. General Information:

12.	**Course Title:**	Radiation Protection				
13.	**Course Code:**					
14.	**Credit Hours:**	**Credit Hours**	**Theory Contact Hours**		**Practical Contact Hours**	
			Lecture	**Tutorial/ Seminar**	**Lab**	**Clinical**
		3	2	--	2	--
15.	**Level/ Semester at which this Course is offered:**	2nd Level / 1st Semester				
16.	**Pre –Requisite (if any):**	Radiation Physics				
17.	**Co –Requisite (if any):**	None				
18.	**Program (s) in which the Course is Offered:**	Bachelor of Radiologic Technology and Medical Imaging				
19.	**Language of Teaching the Course:**	English				
20.	**Location of Teaching the Course:**	Faculty of Applied Medical Science				
21.	**Prepared by:**					
22.	**Date and Number of Approval by Council:**					

II. Course Description:

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III. Course Intended Learning Outcomes (CILOs) :
Upon successful completion of the course, students will be able to:

	A. Knowledge and Understanding:
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a2	Recognize the biological effects of ionizing radiation on human tissues.
	B. Intellectual Skills:
b1	Analyze radiation dose measurements and apply dose reduction techniques.
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	C. Professional and Practical kills:
c1	Implement radiation protection measures in clinical practice.
c2	Use radiation monitoring devices effectively.
	D. Transferable Skills:
d1	Implement radiation protection measures in clinical practice.
d2	Use radiation monitoring devices effectively.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	**Introduction to Radiation Protection**	– History, Principles, Units of Measurement	1	2
2	**Biological Effects of Radiation**	– DNA Damage, Cell Death, Acute and Chronic Effects	1	2
3	**Radiation Dose Measurement and Units**	– Absorbed Dose, Equivalent Dose, Effective Dose	1	2
4	**Radiation Exposure Limits and Regulations**	– International Standards, National Regulations	1	2
5	**Radiation Protection Principles**	– Time, Distance, Shielding	1	2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
6	**Dose Reduction Strategies in Imaging**	– ALARA Principle, Technological Advances	1	2
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8	**Mid-Term Exam**	– In all previous Topics	1	2
9	**Radiation Protection in Nuclear Medicine**	– Radionuclide Handling, Patient Safety	1	2
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12	**Emergency Procedures and Radiation Incidents**	– Spill Management, Incident Reporting	1	2
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16	**Final Theoretical Exam**	– All theoretical topics	1	2
Number of Weeks /and Units Per Semester			**16**	**32**

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No.	Tasks/ Experiments	Number of Weeks	Contact Hours
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2	Evaluating Shielding Effectiveness in Radiology	1	2

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
3	Simulating Radiation Incidents and Response	1	2
4	Case Study: Radiation Protection in Fluoroscopy	1	2
5	Analysis of Dose Reduction Techniques in CT Imaging	1	2
6	Radiological Safety in Nuclear Medicine Procedures	1	2
7	Developing a Radiation Safety Protocol	1	2
8	Hands-on Training with Radiation Monitoring Equipment	1	2
9	Communication Skills for Radiation Risk Management	1	2
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15	Final Practical Exam	1	2
Number of Weeks /and Units Per Semester		**14**	**28**

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No.	Tutorial	Number of Weeks	Contact Hours
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VII. Assessment Methods:

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VII. Assignments:

No.	Assignments	Week Due	Mark
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Total			**100**	**100 %**

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