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

Radiologic Equipment's I

Course Code. (____)

2024

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:	Radiologic Equipment's I				
2.	Course Code:					
3.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours	
			Lecture	Tutorial/ Seminar	Lab	Clinical
		2	2	--	--	--
4.	Level/ Semester at which this Course is offered:	2nd Level / 2nd Semester				
5.	Pre –Requisite (if any):					
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 provides students with an introduction to the fundamental principles, components, and operation of radiologic equipment. The focus is on understanding the X-ray tube, radiographic systems, and basic equipment safety. The course also covers equipment calibration, maintenance, and quality assurance techniques to ensure optimal performance of diagnostic equipment in clinical settings.

III. Course Intended Learning Outcomes (CILOs) :	Referenced PILOs

Upon successful completion of the course, students will be able to:				
	A. Knowledge and Understanding:	**I, P or M/A**		
a1	Understand the basic principles of radiologic equipment operation and components.	**P**	**A2**	Explanation of the principles and procedures of medical imaging acquisitions, medical imaging techniques, and Radiological Technology Sciences as well as patient positioning in computed radiography and MRI techniques.
a2	Describe the functioning and components of an X-ray system and related devices.	**P**	**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 the operational characteristics of radiologic equipment.	**P**	**B3**	Analyze and evaluate evidence-based information needed in medical imaging practice.
b2	Evaluate equipment performance and identify operational issues.	**P**	**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.
	C. Professional and Practical kills:			
c1	Demonstrate the safe operation of basic radiologic equipment.	**P**	**C2**	Apply technical skills in using medical imaging devices, tools, and materials in radiological technology practice.
c2	Perform basic calibration and maintenance of radiologic systems.	**P**	**C1**	Execute quality management system and standard procedures in radiological technology practice.
	D. Transferable Skills:			

d1	Communicate technical information effectively in a clinical setting.	**M**	**D1**	Communicate effectively with clinicians, patients, and support staff.
d2	Collaborate in teams to troubleshoot equipment issues and propose solutions.	**M**	**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 basic principles of radiologic equipment operation and components.	▪ Lectures, demonstrations, video tutorials	▪ Written exams, quizzes
a2	Describe the functioning and components of an X-ray system and related devices.	▪ Lectures, practical sessions	▪ Written exams, practical exams
(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 the operational characteristics of radiologic equipment.	▪ Case studies, group discussions	▪ Case study analysis, written reports
b2	Evaluate equipment performance and identify operational issues.	▪ Lab exercises, troubleshooting sessions	▪ Practical exams, group projects
(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	Demonstrate the safe operation of basic radiologic equipment.	▪ Practical training, simulations	▪ Practical exams, lab reports

c2	Perform basic calibration and maintenance of radiologic systems.	▪ Hands-on calibration sessions	▪ Practical reports, lab work

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

Course Intended Learning Outcomes		Teaching Strategies	Assessment Strategies
d1	Communicate technical information effectively in a clinical setting.	▪ Group work, presentations	▪ Group evaluations
d2	Collaborate in teams to troubleshoot equipment issues and propose solutions.	▪ Role-playing	▪ Practical exams

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	**Introduction to Radiologic Equipment**	– Types of radiologic equipment, X-ray systems overview	1	2	a1, a2
2	**X-ray Tube Components**	– Cathode, anode, focusing cup, filament	1	2	a1, a2
3	**X-ray Tube Operation and Controls**	– Tube current, tube voltage, exposure factors	1	2	a1, a2
4	**High-Voltage Generator and Transformers**	– Step-up and step-down transformers, voltage control	1	2	b1, b2
5	**Radiographic Control Panel and Exposure Factors**	– mAs, kVp, exposure time, safety settings	1	2	a1, b1
6	**X-ray Beam Quality and Filtration**	– Beam intensity, filtration, half-value layer (HVL)	1	2	a2, b1
7	**Mid-term Exam**	– All Previous topics	1	2	a1, a2, b1, b2, c1, c2
8	**Imaging Systems: Film, CR, DR**	– Film systems, computed radiography, digital radiography	1	2	a1, a2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
9	**Radiation Protection in Radiologic Equipment**	– Shielding, collimation, protective devices	1	2	b1, c1
10	**Radiologic Equipment Calibration and Maintenance**	– Quality control, routine maintenance, equipment testing	1	2	b2, c1
11	**Introduction to Fluoroscopy Equipment**	– Fluoroscopy basics, image intensifiers, radiation protection	1	2	a1, b1
12	**Troubleshooting Radiologic Equipment**	– Diagnosing faults, troubleshooting X-ray and imaging systems	1	2	b1, b2
13	**Introduction to CT Equipment**	– CT scanner components, principles of operation	1	2	a2, b1
14	**Radiologic Equipment Safety Standards and Regulations**	– National and international standards, risk management	1	2	a1, b1
15	**Equipment Disposal and Environmental Impact**	– Disposal of old equipment, environmental considerations	1	2	b2, a2
16	**Final Exam**	– All 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	Operating and Setting Up an X-ray System	1	2	a1, a2
2	Conducting Image Quality Control	1	2	b1, b2
3	Handling Radiographic Receptors (Film, CR, DR)	1	2	a1, b2
4	Troubleshooting Common Radiologic Equipment Issues	1	2	b1, b2, d1
5	Performing Equipment Calibration and Maintenance	1	2	c1, c2

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
6	Operating Fluoroscopy Equipment	1	2	a1, b1, d2
7	Conducting a Radiation Protection Survey	1	2	b1, c1, d2
8	Practicing Equipment Disposal and Safety Procedures	1	2	b2, a2
9	Using CT Equipment for Imaging	1	2	a2, b1, d1
10	Implementing Quality Assurance Procedures	1	2	b2, c1
15	**Final Practical Exam**	1	2	a1, a2, b1, b2, c1, c2, d1, d2
Number of Weeks /and Units Per Semester		**11**	**22**	

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**
- **Hands-on Training**
- **Case Studies**
- **Demonstrations**
- **Group Discussions**

VII. Assessment Methods:

- **Written Exams**
- **Practical Exams**
- **Assignments**

- **Quizzes**

VII. Assignments:

No.	Assignments	Week Due	Mark	Aligned CILOs (symbols)
1				
2				
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 Exam**	7	10	10%	a1, a2
2	**Practical Exam**	10	30	30%	a1, a2, b1, b2, c1, c2, d1, d2
3	**Case Study Report**	6	10	10%	b1, b2
4	**Final Exam**	14	50	50%	a2, b1
Total			**100**	**100 %**	

IX. Learning Resources:

1- Required Textbook(s) (maximum two):

1- Stewart C. Bushong - Radiologic Science for Technologists_ Physics, Biology, and Protection (2016, Mosby)
2- Jennifer Kissane, Janet A. Neutze Harjit Singh, 2020, Radiology Fundamentals Introduction to Imaging & Technology, Sixth Edition, Springer Nature Switzerland

2- Essential References:

1- Robert Fosbinder, Denise Orth., 2012, Essentials of radiologic science, Wolters Kluwer Health - Lippincott Williams & Wilkins
2- Chris Guy, Dominic Ffytche, 2005, An Introduction to the Principles of Medical Imaging (rev. ed.)

3- Electronic Materials and Web Sites etc.:

Electronic Materials and Websites

- Radiological Society of North America (RSNA) Resources
- Health Physics Society's Guidelines on Radiation Protection in Radiology
- www.rsna.org
- www.asrt.org

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.
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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

Radiologic Equipment's I

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:

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14.	**Credit Hours:**	**Credit Hours**	**Theory Contact Hours**		**Practical Contact Hours**	
			Lecture	**Tutorial/ Seminar**	**Lab**	**Clinical**
		2	2	--	--	--
15.	**Level/ Semester at which this Course is offered:**	2nd Level / 2nd Semester				
16.	**Pre –Requisite (if any):**					
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				
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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:
a1	Understand the basic principles of radiologic equipment operation and components.
a2	Describe the functioning and components of an X-ray system and related devices.
	B. Intellectual Skills:
b1	Analyze the operational characteristics of radiologic equipment.
b2	Evaluate equipment performance and identify operational issues.
	C. Professional and Practical kills:
c1	Demonstrate the safe operation of basic radiologic equipment.
c2	Perform basic calibration and maintenance of radiologic systems.
	D. Transferable Skills:
d1	Communicate technical information effectively in a clinical setting.
d2	Collaborate in teams to troubleshoot equipment issues and propose solutions.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
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2	**X-ray Tube Components**	– Cathode, anode, focusing cup, filament	1	2
3	**X-ray Tube Operation and Controls**	– Tube current, tube voltage, exposure factors	1	2
4	**High-Voltage Generator and Transformers**	– Step-up and step-down transformers, voltage control	1	2
5	**Radiographic Control Panel and Exposure Factors**	– mAs, kVp, exposure time, safety settings	1	2
6	**X-ray Beam Quality and Filtration**	– Beam intensity, filtration, half-value layer (HVL)	1	2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
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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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3	Handling Radiographic Receptors (Film, CR, DR)	1	2
4	Troubleshooting Common Radiologic Equipment Issues	1	2
5	Performing Equipment Calibration and Maintenance	1	2
6	Operating Fluoroscopy Equipment	1	2

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
7	Conducting a Radiation Protection Survey	1	2
8	Practicing Equipment Disposal and Safety Procedures	1	2
9	Using CT Equipment for Imaging	1	2
10	Implementing Quality Assurance Procedures	1	2
15	**Final Practical Exam**	1	2
Number of Weeks /and Units Per Semester		**11**	**22**

C. Tutorial Aspect (if any):

No.	Tutorial	Number of Weeks	Contact Hours
1	**None**		
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VII. Teaching Strategies:

- **Lectures**
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- **Case Studies**
- **Demonstrations**
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VII. Assessment Methods:

- **Written Exams**
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VII. Assignments:

No.	Assignments	Week Due	Mark
1			
2			
Total			10

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