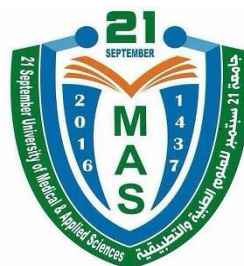


Republic of Yemen
Ministry of Education & Higher Research
Council of Academic Accreditation & Quality Assurance of
Higher Education (CAQA)



**21 september 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 II
Course Code. (____)

2024



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

Prepared by:

Reviewed by:

Dr. -----

Head of the Department:

Dr. Awadh Al-Kubati

Quality Unit:

Dr. Mohammed
Al-shamahi

Dean:

Dr. Abdulsalam
Dalaq

I. General Information:

1.	Course Title:	Radiologic Equipment's II				
2.	Course Code:					
3.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours	
			Lecture	Tutorial/ Seminar	Lab	Clinical
		2	2	--	2	--
4.	Level/ Semester at which this Course is offered:	2 nd Level / 2 nd Semester				
5.	Pre –Requisite (if any):	Radiologic Equipment's I				
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 builds on the concepts learned in Radiologic Equipment's I, focusing on advanced radiologic equipment, including Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and Ultrasound. Students will study the principles, operation, and safety aspects of these complex imaging systems. The course includes detailed exploration of system components, imaging principles, image quality control, and routine maintenance of these advanced technologies. Additionally, the course introduces the integration of these imaging systems in modern radiology departments.

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 and components of advanced radiologic equipment (CT, MRI, Ultrasound).	A	A2	Explanation of 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	Describe the operation of these advanced systems in clinical practice.	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 the image quality and performance of CT, MRI, and Ultrasound systems.	M	B3	Analyze and evaluate evidence-based information needed in medical imaging practice.
b2	Evaluate troubleshooting techniques for advanced imaging equipment.	M	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 skills:				
c1	Operate CT, MRI, and Ultrasound equipment under supervision.	M	C2	Apply technical skills in using medical imaging devices, tools, and materials in radiological technology practice.
c2	Perform basic calibration and maintenance for advanced imaging systems.	M	C1	Execute quality management system and standard procedures in radiological technology practice.

D. Transferable Skills:				
d1	Communicate effectively with clinical teams regarding equipment performance.	A	D1	Communicate effectively with clinicians, patients, and support staff.
d2	Collaborate in troubleshooting and decision-making processes for equipment issues.	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 and components of advanced radiologic equipment (CT, MRI, Ultrasound).	Lectures, demonstrations, video tutorials	Written exams, quizzes
a2	Describe the operation of these advanced systems in clinical practice.	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 image quality and performance of CT, MRI, and Ultrasound systems.	Case studies, group discussions	Case study analysis, written reports
b2	Evaluate troubleshooting techniques for advanced imaging equipment.	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	Operate CT, MRI, and Ultrasound equipment under supervision.	Practical training, simulations	Practical exams, lab reports

c2	Perform basic calibration and maintenance for advanced imaging 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 effectively with clinical teams regarding equipment performance.	Group work, presentations	Group evaluations
d2	Collaborate in troubleshooting and decision-making processes for equipment issues.	Role-playing	

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	Introduction to Advanced Radiologic Equipment	– Overview of CT, MRI, Ultrasound systems	1	2	a1, a2
2	Computed Tomography (CT) Principles	– CT system components, operation, and image reconstruction	1	2	a1, a2
3	CT Image Quality and Radiation Dose	– Image quality factors, dose optimization, safety considerations	1	2	a2, b1
4	Magnetic Resonance Imaging (MRI) Principles	– MRI components, magnetic fields, RF coils, imaging sequence	1	2	a1, a2
5	MRI Image Quality and Safety	– Signal-to-noise ratio, artifacts, patient safety in MRI	1	2	a2, b1
6	Ultrasound Principles	– Ultrasound waves, transducers, image formation	1	2	a1, a2
7	Mid-term Exam	– All Previous topics	1	2	a1, a2, b1, b2, c1, c2

Prepared by:

Reviewed by:
Dr. -----

Head of the Department:
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Quality Unit:
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Al-shamahi

Dean:
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Dalaq

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
8	Ultrasound Imaging Techniques and Artifacts	– Types of ultrasound imaging, artifact recognition	1	2	a2, b1
9	Advanced Imaging Systems Integration	– Interfacing between CT, MRI, Ultrasound, and PACS systems	1	2	a2, b1
10	Image Processing and Reconstruction	– Image enhancement techniques, 3D reconstruction	1	2	b1, b2
11	Equipment Calibration and Quality Control	– Calibration techniques for CT, MRI, and Ultrasound	1	2	c1, c2
12	Routine Maintenance of Advanced Imaging Systems	– Preventative maintenance, troubleshooting common faults	1	2	c1, c2
13	Radiation Protection in Advanced Imaging Systems	– Safety measures, radiation dose monitoring	1	2	b2, c1
14	Case Studies: Troubleshooting Advanced Imaging Systems	– Analyzing real-world scenarios and proposing solutions	1	2	b2, d2
15	Future Trends in Radiologic Technology	– Innovations in CT, MRI, and Ultrasound, emerging technologies	1	2	a2, d1
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 a CT Scanner and Performing Image Acquisition	1	2	a1, c1
2	Performing MRI Scan and Image Acquisition	1	2	a2, c1

No.	Tasks/ Experiments	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
3	Operating Ultrasound Equipment and Obtaining Images	1	2	a1, c1
4	Image Quality Control for CT, MRI, and Ultrasound	1	2	b1, c2
5	Troubleshooting CT Equipment	1	2	b2, c2
6	Troubleshooting MRI Equipment	1	2	b2, c2
7	Troubleshooting Ultrasound Equipment	1	2	b2, c2
8	Performing Calibration for Advanced Imaging Systems	1	2	c1, c2
9	Radiation Safety Measures in Advanced Imaging Systems	1	2	b2, c1
10	Analyzing Case Studies and Proposing Equipment Solutions	1	2	B2, D2
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:

Prepared by:

Reviewed by:
Dr. -----

Head of the Department:
Dr. Awadh Al-Kubati

Quality Unit:
Dr. Mohammed
Al-shamahi

Dean:
Dr. Abdulsalam
Dalaq

- Lectures
- Practical Sessions
- 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%	b1, c1, c2, d1, d2
3	Case Study Report	6	10	10%	b2, d2
4	Final Exam	14	50	50%	a2, b1
Total			100	100 %	

IX. Learning Resources:

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

Prepared by:

Reviewed by:
Dr. -----

Head of the Department:
Dr. Awadh Al-Kubati

Quality Unit:
Dr. Mohammed
Al-shamahi

Dean:
Dr. Abdulsalam
Dalaq

- 1- Stewart C. Bushong, 2020, Radiologic Science for Technologists: Physics, Biology, and Protection, 12th Edition, Elsevier
- 2- Richard Carlton, Arlene Adler, Vesna Balac, 2019, Principles of Radiographic Imaging: An Art and A Science, 6th Edition, Cengage Learning.

2- Essential References:

- 1- Angshul Majumdar, Rabab Ward, 2018, MRI: Physics, Image Reconstruction, and Analysis (Devices, Circuits, and Systems), CRC Press
- 2- Jiang Hsieh, 2003, Computed Tomography: Principles, Design, Artifacts, and Recent Advances, SPIE Press.
- 3- Guillermo Avendaño Cervantes, 2016, Technical Fundamentals of Radiology and CT, IOP Publishing Ltd
- 4- Robert W. Brown, Yu-Chung N. Cheng, E. Mark Haacke, 2014, Magnetic Resonance Imaging: Physical Principles and Sequence Design, John Wiley & Sons, Inc.
- 5- Haim Azhari, 2010, Basics of Biomedical Ultrasound for Engineers, John Wiley & Sons, Inc.
- 6- Willi A. Kalender, 2011, Computed Tomography: Fundamentals, System Technology, Image Quality, Applications, John Wiley & Sons.

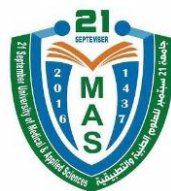
3- Electronic Materials and Web Sites etc.:

Electronic Materials and Websites

- Radiological Society of North America (RSNA) Resources
- American College of Radiology (ACR) guidelines
- 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.
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.
3	Exam Attendance/Punctuality: No student shall be allowed to the exam hall after 30 minutes of the start time, and shall not leave the hall before half of the exam time has passed.

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 II 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

I. General Information:

12.	Course Title:	Radiologic Equipment's II				
13.	Course Code:					
14.	Credit Hours:	Credit Hours	Theory Contact Hours		Practical Contact Hours	
			Lecture	Tutorial/ Seminar	Lab	Clinical
		2	2	--	2	--
15.	Level/ Semester at which this Course is offered:	2 nd Level / 2 nd Semester				
16.	Pre –Requisite (if any):	Radiologic Equipment's I				
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:

This course builds on the concepts learned in Radiologic Equipment's I, focusing on advanced radiologic equipment, including Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and Ultrasound. Students will study the principles, operation, and safety aspects of these complex imaging systems. The course includes detailed exploration of system components, imaging principles, image quality control, and routine maintenance of these advanced technologies. Additionally, the course introduces the integration of these imaging systems in modern radiology departments.

III. Course Intended Learning Outcomes (CILOs) :

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

A. Knowledge and Understanding:

a1 Understand the principles and components of advanced radiologic equipment (CT, MRI, Ultrasound).

A2 Describe the operation of these advanced systems in clinical practice.

B. Intellectual Skills:

b1 Analyze the image quality and performance of CT, MRI, and Ultrasound systems.

B2 Evaluate troubleshooting techniques for advanced imaging equipment.

C. Professional and Practical skills:

c1 Operate CT, MRI, and Ultrasound equipment under supervision.

C2 Perform basic calibration and maintenance for advanced imaging systems.

D. Transferable Skills:

d1 Communicate effectively with clinical teams regarding equipment performance.

D2 Collaborate in troubleshooting and decision-making processes for equipment issues.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
1	Introduction to Advanced Radiologic Equipment	– Overview of CT, MRI, Ultrasound systems	1	2
2	Computed Tomography (CT) Principles	– CT system components, operation, and image reconstruction	1	2
3	CT Image Quality and Radiation Dose	– Image quality factors, dose optimization, safety considerations	1	2
4	Magnetic Resonance Imaging (MRI) Principles	– MRI components, magnetic fields, RF coils, imaging sequence	1	2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours
5	MRI Image Quality and Safety	– Signal-to-noise ratio, artifacts, patient safety in MRI	1	2
6	Ultrasound Principles	– Ultrasound waves, transducers, image formation	1	2
7	Mid-term Exam	– All Previous topics	1	2
8	Ultrasound Imaging Techniques and Artifacts	– Types of ultrasound imaging, artifact recognition	1	2
9	Advanced Imaging Systems Integration	– Interfacing between CT, MRI, Ultrasound, and PACS systems	1	2
10	Image Processing and Reconstruction	– Image enhancement techniques, 3D reconstruction	1	2
11	Equipment Calibration and Quality Control	– Calibration techniques for CT, MRI, and Ultrasound	1	2
12	Routine Maintenance of Advanced Imaging Systems	– Preventative maintenance, troubleshooting common faults	1	2
13	Radiation Protection in Advanced Imaging Systems	– Safety measures, radiation dose monitoring	1	2
14	Case Studies: Troubleshooting Advanced Imaging Systems	– Analyzing real-world scenarios and proposing solutions	1	2
15	Future Trends in Radiologic Technology	– Innovations in CT, MRI, and Ultrasound, emerging technologies	1	2
16	Final Exam	– All topics	1	2
Number of Weeks /and Units Per Semester			16	32

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

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	Operating a CT Scanner and Performing Image Acquisition	1	2
2	Performing MRI Scan and Image Acquisition	1	2
3	Operating Ultrasound Equipment and Obtaining Images	1	2

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
4	Image Quality Control for CT, MRI, and Ultrasound	1	2
5	Troubleshooting CT Equipment	1	2
6	Troubleshooting MRI Equipment	1	2
7	Troubleshooting Ultrasound Equipment	1	2
8	Performing Calibration for Advanced Imaging Systems	1	2
9	Radiation Safety Measures in Advanced Imaging Systems	1	2
10	Analyzing Case Studies and Proposing Equipment Solutions	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		
2			
3			
Number of Weeks /and Units Per Semester			

VII. Teaching Strategies:

- Lectures
- Practical Sessions
- Case Studies
- Demonstrations
- Group Discussions

VII. Assessment Methods:

- Written Exams
- Practical Exams

Prepared by:

Reviewed by:

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Head of the Department:

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Dalaq

- Assignments
- Quizzes

VII. Assignments:

No.	Assignments	Week Due	Mark
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2			
Total			10

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

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