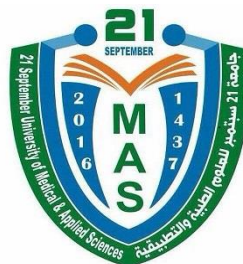


Republic of Yemen
Ministry of Education & Higher Research
Council of Academic Accreditation & Quality Assurance of
Higher Education (CAQA)



**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

Ultrasound Technique

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:	Ultrasound Technique				
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:	4 th Level / 2 nd Semester				
5.	Pre –Requisite (if any):	Ultrasound physics, Anatomy, Physiology,				
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:

The **Ultrasound Technique** course introduces students to the theory and practice of ultrasound imaging. The course focuses on the fundamental principles of ultrasound technology, its clinical applications, and the operation of various ultrasound equipment. Emphasis is placed on learning the techniques for imaging different anatomical structures such as the abdomen, pelvis, and soft tissues. Students will develop the skills necessary to perform ultrasound examinations, interpret images, and ensure patient safety during procedures. The course also covers the latest advancements in ultrasound technology, including Doppler imaging and 3D/4D ultrasound.

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 physics of ultrasound imaging.	A	A1	Demonstrate an understanding of fundamental knowledge of Biomedical sciences (Biology, Biophysics, Anatomy, Physiology, Sectional anatomy, and medical imaging technique).
a2	Learn the clinical applications of ultrasound in different areas of the body.	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.
B. Intellectual Skills:				
b1	Evaluate ultrasound images for diagnostic purposes.	M	B3	Analyze and evaluate evidence-based information needed in medical imaging practice.
b2	Analyze the advantages and limitations of ultrasound imaging.	M		
C. Professional and Practical skills:				
c1	Perform ultrasound examinations on various anatomical regions.	M	C2	Apply technical skills in using medical imaging devices, tools, and materials in radiological technology practice.
c2	Ensure patient comfort and safety during ultrasound procedures.	M	C1	Execute quality management system and standard procedures in radiological technology practice.
D. Transferable Skills:				
d1	Communicate effectively with patients and healthcare	A	D1	Communicate effectively with clinicians, patients, and support staff.

	professionals regarding ultrasound results.			
d2	Demonstrate critical thinking in troubleshooting ultrasound equipment and imaging 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 physics of ultrasound imaging.	Lectures, demonstrations, and multimedia presentations on ultrasound principles.	Quizzes, final exam.
a2	Learn the clinical applications of ultrasound in different areas of the body.	Clinical demonstrations, guest lectures by ultrasound experts.	Practical assignments, case studies.

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

Course Intended Learning Outcomes		Teaching Strategies	Assessment Strategies
b1	Evaluate ultrasound images for diagnostic purposes.	Image interpretation exercises, clinical case discussions.	Case study analysis, oral presentations.
b2	Analyze the advantages and limitations of ultrasound imaging.	Comparative analysis of ultrasound with other imaging modalities.	Written reports, practical evaluations.

(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
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c1	Perform ultrasound examinations on various anatomical regions.	Hands-on practice with ultrasound machines, lab sessions.	Practical exams, practical evaluations.
c2	Ensure patient comfort and safety during ultrasound procedures.	Role-playing scenarios, patient interaction workshops.	Lab performance, patient safety assessments.
(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 patients and healthcare professionals regarding ultrasound results.	Group discussions, case presentation sessions.	Participation in group discussions.
d2	Demonstrate critical thinking in troubleshooting ultrasound equipment and imaging issues.	Troubleshooting exercises and real-world case scenarios.	Practical assessments.

IV. Course Contents:

A. Theoretical Aspect:

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
1	Introduction to Ultrasound Technology	– History, basic principles of ultrasound, types of ultrasound machines, safety protocols	1	2	a1, a2
2	Physics of Ultrasound	– Sound waves, frequency, wavelength, Doppler effect, acoustic impedance	1	2	a1, a2
3	Ultrasound Imaging Modes	– A-mode, B-mode, M-mode, Doppler ultrasound, 3D/4D ultrasound	1	2	a1, b1
4	Ultrasound Equipment and Instrumentation	– Transducers, probes, ultrasound machine settings,	1	2	a2, c2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
		maintenance and troubleshooting			
5	Image Quality and Artifacts in Ultrasound	– Factors affecting image quality, common artifacts, and troubleshooting techniques	1	2	b2, c1
6	Abdominal Ultrasound Imaging	– Imaging the liver, gallbladder, pancreas, kidneys, and spleen	1	2	a2, b1
7	Mid-term Exam	– All Previous topics	1	2	a1, a2, b1, b2, c1
8	Pelvic Ultrasound Imaging	– Imaging the uterus, ovaries, bladder, prostate, and pelvic muscles	1	2	a2, b1
9	Obstetric Ultrasound Imaging	– First, second, and third trimester imaging, fetal development, and measurement techniques	1	2	a2, b2
10	Musculoskeletal Ultrasound Imaging	– Imaging of joints, muscles, tendons, and ligaments	1	2	a2, b2
11	Doppler Ultrasound Imaging	– Principles of Doppler ultrasound, blood flow assessment, color Doppler, power Doppler	1	2	a1, b1
12	Ultrasound in Cardiology	– Imaging the heart, valves, blood vessels, echocardiography, and Doppler in cardiovascular disease	1	2	a2, b1
13	Ultrasound-Guided Procedures	– Biopsy, fluid drainage, and needle localization techniques	1	2	c1, c2
14	Pediatric Ultrasound Imaging	– Imaging techniques and challenges in pediatric ultrasound, common pediatric conditions	1	2	a2, b2
15	Advances in Ultrasound Technology	– 3D/4D imaging, elastography, contrast-enhanced ultrasound, and future trends	1	2	a2, d2

No.	Units/Topics List	Sub Topics List	Number of Weeks	Contact Hours	Learning Outcomes (CILOs)
16	Final Exam	– All topics	1	2	a1, a2, a3, 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	Hands-on Practice: Abdominal Ultrasound	1	2	c1, b1
2	Case Study: Pelvic Ultrasound Imaging	1	2	a2, c1
3	Doppler Ultrasound Practical	1	2	b1, c1
4	Hands-on Practice: Obstetric Ultrasound	1	2	c1, a2
5	Ultrasound in Musculoskeletal Imaging Practical	1	2	c1, a2
6	Case Study: Cardiac Ultrasound Imaging	1	2	b1, c1
7	Hands-on Practice: Pediatric Ultrasound Imaging	1	2	c1, a2
8	Ultrasound-Guided Biopsy and Fluid Aspiration	1	2	c1, c2
9	Ultrasound in Emergency Medicine: Trauma Imaging	1	2	a2, c1
10	Final Project: Advanced Ultrasound Applications in Clinical Settings	1	2	d2, a2, b2
15	Final Practical Exam	1	2	a2, b1, b2, c1, c2, d2
Number of Weeks /and Units Per Semester		11	22	

C. Tutorial Aspect (if any):

Prepared by:

Reviewed by:

Dr. -----

Head of the Department:

Dr. Awadh Al-Kubati

Quality Unit:

Dr. Mohammed
Al-shamahi

Dean:

Dr. Abdulsalam
Dalaq

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
- Practical Sessions
- Case Studies and Simulations
- Workshops

VII. Assessment Methods:

- Written Exams
- Practical Exams
- Case Study Reports
- Quizzes
- Presentation

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	Case Study Report	Week 10	10	10%	a2, b1
2	Practical Exam	Week 15	30	30%	c1, a2
3	Mid-term Exam	Week 7	10	10%	b1, c1
4	Final Exam	Week 16	50	50%	d2, a2, b2
Total			100	100 %	

IX. Learning Resources:

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

- 1- Matthias Hofer, 2020, Ultrasound Teaching Manual: The Basics of Performing and Interpreting Ultrasound Scans, 4th Edition, Thieme.
- 2- Valery Tchacarski, Rumyana Krasteva, Emilia Mincheva, Anelia Boueva, Ivo Iliev, Dimitar Popov, 2015, Atlas of diagnostic Ultrasound: Ultrasonography, Valery Tchacarski.

2- Essential References:

- 1- Justin Bowra, Russell E McLaughlin, Paul Atkinson, Jaimie L Henry, 2021, Emergency Ultrasound Made Easy, 3rd Edition, Elsevier.
- 2- Abigail Thrush, Timothy Hartshorne, Colin Richard Deane, 2021, Vascular Ultrasound, 4th Edition, Elsevier.
- 3- Nicola Davidson, 2022, Abdominal Ultrasound, 4th Edition, Elsevier.
- 4- John M. D. O'Neill, 2008, Musculoskeletal Ultrasound: Anatomy and Technique, Springer Science & Business Media.
- 5- Philip E. S. Palmer, 1995, Manual of Diagnostic Ultrasound, World Health Organization
- 6- Elisabetta Buscarini, Harald Lutz and Paoletta Mirk, 2013, Manual of diagnostic ultrasound, 2nd ed Vol 2, World Health Organization.

3- Electronic Materials and Web Sites etc.:

Electronic Materials and Websites

- A Beginner's Guide to Ultrasound, <https://geekymedics.com/a-beginners-guide-to-ultrasound/>
- Renal Ultrasound Made Easy: Step-By-Step Guide, <https://www.pocus101.com/renal-ultrasound-made-easy-step-by-step-guide/>
- www.ultrasound-physics.com
- www.radiologyinfo.org

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

Prepared by:

Reviewed by:

Dr. -----

Head of the Department:

Dr. Awadh Al-Kubati

Quality Unit:

Dr. Mohammed
Al-shamahi

Dean:

Dr. Abdulsalam
Dalaq

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.
8	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 Ultrasound Technique 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:	Ultrasound Technique				
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:	4 th Level / 2 nd Semester				
16.	Pre –Requisite (if any):	Ultrasound physics, Anatomy, Physiology,				
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:

The **Ultrasound Technique** course introduces students to the theory and practice of ultrasound imaging. The course focuses on the fundamental principles of ultrasound technology, its clinical applications, and the operation of various ultrasound equipment. Emphasis is placed on learning the techniques for imaging different anatomical structures such as the abdomen, pelvis, and soft tissues. Students will develop the skills necessary to perform ultrasound examinations, interpret images, and ensure patient safety during procedures. The course also covers the latest advancements in ultrasound technology, including Doppler imaging and 3D/4D ultrasound.

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 physics of ultrasound imaging. |
| a2 | Learn the clinical applications of ultrasound in different areas of the body. |

B. Intellectual Skills:

- | | |
|----|---|
| b1 | Evaluate ultrasound images for diagnostic purposes. |
| b2 | Analyze the advantages and limitations of ultrasound imaging. |

C. Professional and Practical skills:

- | | |
|----|---|
| c1 | Perform ultrasound examinations on various anatomical regions. |
| c2 | Ensure patient comfort and safety during ultrasound procedures. |

D. Transferable Skills:

- | | |
|----|--|
| d1 | Communicate effectively with patients and healthcare professionals regarding ultrasound results. |
| d2 | Demonstrate critical thinking in troubleshooting ultrasound equipment and imaging issues. |

IV. Course Contents:

A. Theoretical Aspect:

No.	Introduction to Physiology	Homeostasis, Cell Physiology	Number of Weeks	Contact Hours
1	Introduction to Ultrasound Technology	– History, basic principles of ultrasound, types of ultrasound machines, safety protocols	1	2
2	Physics of Ultrasound	– Sound waves, frequency, wavelength, Doppler effect, acoustic impedance	1	2
3	Ultrasound Imaging Modes	– A-mode, B-mode, M-mode, Doppler ultrasound, 3D/4D ultrasound	1	2

Prepared by:

Reviewed by:

Dr. -----

Head of the Department:

Dr. Awadh Al-Kubati

Quality Unit:

Dr. Mohammed
Al-shamahi

Dean:

Dr. Abdulsalam
Dalaq

No.	Introduction to Physiology	Homeostasis, Cell Physiology	Number of Weeks	Contact Hours
4	Ultrasound Equipment and Instrumentation	– Transducers, probes, ultrasound machine settings, maintenance and troubleshooting	1	2
5	Image Quality and Artifacts in Ultrasound	– Factors affecting image quality, common artifacts, and troubleshooting techniques	1	2
6	Abdominal Ultrasound Imaging	– Imaging the liver, gallbladder, pancreas, kidneys, and spleen	1	2
7	Mid-term Exam	– All Previous topics	1	2
8	Pelvic Ultrasound Imaging	– Imaging the uterus, ovaries, bladder, prostate, and pelvic muscles	1	2
9	Obstetric Ultrasound Imaging	– First, second, and third trimester imaging, fetal development, and measurement techniques	1	2
10	Musculoskeletal Ultrasound Imaging	– Imaging of joints, muscles, tendons, and ligaments	1	2
11	Doppler Ultrasound Imaging	– Principles of Doppler ultrasound, blood flow assessment, color Doppler, power Doppler	1	2
12	Ultrasound in Cardiology	– Imaging the heart, valves, blood vessels, echocardiography, and Doppler in cardiovascular disease	1	2
13	Ultrasound-Guided Procedures	– Biopsy, fluid drainage, and needle localization techniques	1	2
14	Pediatric Ultrasound Imaging	– Imaging techniques and challenges in pediatric ultrasound, common pediatric conditions	1	2
15	Advances in Ultrasound Technology	– 3D/4D imaging, elastography, contrast-enhanced ultrasound, and future trends	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):

Prepared by:

Reviewed by:
Dr. -----

Head of the Department:
Dr. Awadh Al-Kubati

Quality Unit:
Dr. Mohammed
Al-shamahi

Dean:
Dr. Abdulsalam
Dalaq

No.	Tasks/ Experiments	Number of Weeks	Contact Hours
1	Hands-on Practice: Abdominal Ultrasound	1	2
2	Case Study: Pelvic Ultrasound Imaging	1	2
3	Doppler Ultrasound Practical	1	2
4	Hands-on Practice: Obstetric Ultrasound	1	2
5	Ultrasound in Musculoskeletal Imaging Practical	1	2
6	Case Study: Cardiac Ultrasound Imaging	1	2
7	Hands-on Practice: Pediatric Ultrasound Imaging	1	2
8	Ultrasound-Guided Biopsy and Fluid Aspiration	1	2
9	Ultrasound in Emergency Medicine: Trauma Imaging	1	2
10	Final Project: Advanced Ultrasound Applications in Clinical Settings	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 and Simulations

- Workshops

VII. Assessment Methods:

- Written Exams
- Practical Exams
- Case Study Reports
- Quizzes
- Presentation

VII. Assignments:

No.	Assignments	Week Due	Mark
1			
2			
Total			10

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

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1	Case Study Report	Week 10	10	10%
2	Practical Exam	Week 15	30	30%
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4	Final Exam	Week 16	50	50%
Total			100	100 %

IX. Learning Resources:

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

1. Matthias Hofer, 2020, Ultrasound Teaching Manual: The Basics of Performing and Interpreting Ultrasound Scans, 4th Edition, Thieme.

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6. Elisabetta Buscarini, Harald Lutz and Paoletta Mirk, 2013, Manual of diagnostic ultrasound, 2nd ed Vol 2, World Health Organization.

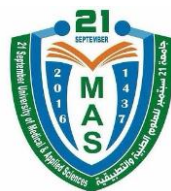
3- Electronic Materials and Web Sites etc.:

Electronic Materials and Websites

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- www.ultrasound-physics.com
- www.radiologyinfo.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.
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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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