

Department of Radiology Technologies (the second stage/Second semester)



Computed tomography techniques course

Teaching the student the principle of operation of the Computed tomography scanner and the main parts of this device

1. Educational institution	Al-Ayen Iraqi University, College of Health and Medical Technologies
2. Scientific department/center	Department of Radiology Technologies
3. Course name/code	Computed tomography techniques
4. Available forms of attendance	%100
5. Annual/ courses	Courses
6. Number of study hours (total)	2 theoretical hours + 5 practical hours = 7 hours x 15 weeks = 105 hours
7. Date this description was prepared	2024
8. Course objectives 1. Describe the different generations of CT systems. 2. Linking the components of the CT system to their functions. Discuss image reconstruction via interpolation, backprojection, and iteration. 3. Explain helical imaging and multi-detector computed tomography. 4. Describe the characteristics of the CT image of the image matrix. 5. Explain the factors that affect CT image quality, as they relate to spatial resolution and contrast. 6. Learn about other technical applications of CT imaging.	

10. Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives The student must be familiar with and understand the basic principles of the CT scanner
B - The skills objectives of the course. The student has the ability to know the basic parts of the microscope and the impact of each part on the operation of the device
Teaching and learning methods
1. Lectures 2. Video clips
Evaluation methods
1. Written exams every week. 2. Daily oral evaluation. 3. Semester exams.
D - General and qualifying transferable skills (other skills related to employability and personal development). • Teaching the student to deal with patients and various situations. • Teaching students psychological care skills for people with disabilities and oncology patients.

11. Course structure					
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Apply and test	Interactive	History of Computed Tomography	Understands the material	7	1.
Apply and test	Interactive	Basic principles of CT Scanners	Understands the material	7	2.
Apply and test	Interactive	Helical/spiral CT Scanners:	Understands the material	7	3.
Apply and test	Interactive	Interpolation Algorithms	Understands the material	7	4.
Apply and test	Interactive	Multislice Computed Tomography (MSCT) (multidetector -row) CT	Understands the material	7	5.
Apply and test	Interactive	CT system design: (SSCT & MSCT)	Understands the material	7	6.
Apply and test	Interactive	Collimation,	Understands the material	7	7.
Apply and test	Interactive	Control Console	Understands the material	7	8.
Apply and test	Interactive	Reconstruction methods	Understands the material	7	9.
Apply and test	Interactive	Iterative reconstruction	Understands the material	7	10.
Apply and test	Interactive	CT image quality	Understands the material	7	11.
Apply and test	Interactive	Image noise	Understands the material	7	12.
Apply and test	Interactive	Image artifacts	Understands the material	7	13.
Apply and test	Interactive	Positron Emission Tomography/CT (PET/CT)	Understands the material	7	14.
Apply and test	Interactive	Advanced technical CT applications :	Understan	7	15.

			ds the material		
12. Infrastructure					
1- Required prescribed books			Training bag		
2- Main references (sources)			1. Stewart Carlyle Bushong, <i>“Radiologic Science for Technologists Physics, Biology, and Protection”</i> Elsevier, Inc. , 7 th edition, 2017. 2. Chris Guy & Dominic ffytche, <i>“An Introduction to The Principles of Medical Imaging”</i> , Imperial College Press, 2005. 3. Perry Sprawls, <i>“Physical principles of medical imaging”</i> , 2 nd Edition 1996. 4. J. Hsieh, <i>“Computed Tomography: Principles, Design, Artifacts, and Recent Advances”</i> , 2 nd ed. Wiley Inter-science, Bellingham, Washington, USA, (2009) 5. Euclid Seeram, <i>“ Computed tomography : physical principles, clinical applications, and quality control”</i> 4 th edition, Elsevier Inc. 2016.		
A-Recommended books and references (scientific journals, reports,...)			Computed Tomography for Technologists CT step by step		
B - Electronic references, Internet sites...			Radiopedia.org		

13. Course development plan
The curriculum development plan is based on the following: • Giving the prescribed scientific material and observing and analyzing the students’ results • Study feedback from students’ comments about vocabulary • Study the practical laboratory notes for the course • Comparing current vocabulary with the vocabulary of corresponding colleges in the field

Computerized tomography physics course

It specializes in the study of radiation in terms of its origin, methods, generation, interaction of radiation with matter, the human body, its dangers, and how to deal with it. It specializes in a theoretical study of the basics of CT generation.

1. Educational institution	Al-Ayen Iraqi University, College of Health and Medical Technologies
2. Scientific department/center	Department of Radiology Technologies
3. Course name/code	Computerized tomography physics course
4. Available forms of attendance	%100
5. Annual/ courses	Courses
6. Number of study hours (total)	2 theoretical hours + 3 practical hours = 5 hours x 15 weeks = 75 hours
7. Date this description was prepared	2024
8. Course objectives 1. Explaining the methods of producing rays and the interaction processes between CT and determine the factors affecting the electron beam. 2. Determine the factors affecting the outputs of X-rays and CT scans	

10. Course outcomes and teaching, learning and evaluation methods
A- Cognitive objectives 1- A deep understanding of CT diagnosis and treatment 2-Understanding the science of growth and development in CT. 3- The ability to deal with modern devices and technologies 4-Responding to recent developments in the field of CT
B - The skills objectives of the course. 1 - Identify habits and skills using X-Ray technology 2- Know the factors and problems surrounding X-Ray technology

methods Teaching and learning
1- leactures 2- video clips
Evaluation methods
1. Written exams every week. 2. Daily oral evaluation. 3. Semester exams.
C- Emotional and evaluation objectives c1 - the student should be convinced of the importance of the specialty he is studying C 2 - The effort of teaching staff and technicians in providing scientific material is appreciated. C3 - Groups of students participate in group work. C 4- the student should be respects sincerity in work and hates cheating
D - General and qualifying transferable skills (other skills related to employability and personal development). D1- Using the electronic sense in the field of specialization D2- The ability to collect information and analyze its main ideas D3 - Writing technical reports about devices in the field of specialization

11. Course structure					
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Test and apply	Interactive	Introduction and overview	Understands the material	5	.1
Test and apply	Interactive	Basic Physics : Projected ray radiation attenuation Energy Dependence	Understands the material	5	.2
Test and apply	Interactive	CT numbers: Accuracy & uniformity -Hounsfield unit, scale	Understands the material	5	.3
Test and apply	Interactive	CT image: Window window width and level	Understands the material	5	.4
Test and apply	Interactive	Data Acquisition + basic concepts for data acquisition sampling	Understands the material	5	5
Test and apply	Interactive	Data Acquisition Geometries: Data acquisition in : -first generation Scanners -second generation Scanners -third generation Scanners -Fourth generation Scanners	Understands the material	5	6
Test and apply	Interactive	fifth generation Scanners -Spiral-Helical Geometry -Dual source CT Scanner .	Understands the material	5	7
Test and apply	Interactive	Multislice Computed Tomography (MSCT).	Understands the material	5	8
Test and apply	Interactive	Data Processing mage reconstruction Views	Understands the material	5	9
Test and apply	Interactive	Data Flow in a CT Scanner - Sequence of Events	Understands the material	5	10
Test and apply	Interactive	Image Display, Storage, and Communication	Understands the material	5	11
Test and apply	Interactive	Format the CT image + Image matrix Pixel Voxel	Understands material the	5	12
Test and apply	Interactive	Field Of View (FOV) in CT : Display field of view (DFOV (Scan field of view (SFOV (	Understands the material	5	13
Test and apply	Interactive	Basic CT Physics	Understands the material	5	14
Test and apply	Interactive	Image Axes	Understands the material	5	15

12. Infrastructure	
1- Required prescribed books	Training bag
2- Main references (sources)	1-M. Radhi Al-Qurayshi and H. Qasim. AL-Mosawi "Radiation Physics and its applications in diagnostic radiological techniques", Middle Technical University (MTU), Iraq, (2015). 2- W. R. Hendee and E. R. Ritenour "Medical Imaging Physics", 4th Edition, Wiley-Liss, Inc., (2002). 3- Stewart Carlyle Bushong, "Radiologic Science for Technologists Physics, Biology, and Protection" Elsevier, Inc., 7th edition, 2017.
A-Recommended books and references (scientific journals, reports,...)	An Introduction to The Principles of Medical Imaging Physical principles of medical imaging book
B - Electronic references, Internet sites...	Radiopedia.org

13. Course development plan
The curriculum development plan focuses on the following: 1 - Giving the prescribed scientific material and observing and analyzing the students' results. 2 - Studying feedback from students' comments about vocabulary. 3 - Study the practical laboratory notes for the course. 4 - Comparing the current vocabulary with the vocabulary of corresponding colleges in the field

Radiographic techniques of the lower extremities Course

This course is concerned with studying imaging of all examinations of the lower extremities and studying interpretations of radiographs to arrive at imaging methods and correct diagnosis.

1. Educational institution	Al-Ayen Iraqi University, College of Health and Medical Technologies
2. Scientific department/center	Department of Radiology Technologies
3. Course name/code	Radiographic techniques of the lower extremities
4. Available forms of attendance	%100
5. Annual/ courses	Courses
6. Number of study hours (total)	2 theoretical hours + 5 practical hours = 7 hours x 15 weeks = 105 hours
7. Date this description was prepared	2024
8. Course objectives Teach students how to direct the patient in a specific imaging way to best view pathology of the lower extremities.	

10. Course outcomes and teaching, learning and evaluation methods
A- Cognitive objectives 1- Knowing and understanding radiography/examinations of the lower extremities, knowing the diseases related to them, and understanding the results of radiography in order to reach the most accurate methods of special radiography in them. 2- Knowing and understanding the imaging of joint examinations in the lower extremity areas, knowing the diseases related to them, and understanding the results of radiographic imaging in order to reach the most accurate methods of special radiographic imaging therein. 3- Knowledge and understanding of bones, fractures and their types 4- Knowledge of the operation of the X-ray machine

B - The skills objectives of the course. 1 - Imaging all examinations of the lower extremities 2- Imaging all examinations of the joints and pelvic area 3 - Studying interpretations of radiographs to arrive at imaging methods and correct diagnosis
Teaching and learning methods
• Lectures • Video clips
Evaluation methods
1. Written exams every week. 2. Daily oral evaluation. 3. Semester exams.
D - General and qualifying transferable skills (other skills related to employability and personal development). • 1- Methods of guidance and how to deal with the patient • 2- Computer Encyclopedia of Applications • 3- Adding modern equipment such as CR – DR at work

11. Course structure					
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Apply and test	Interactive	Method image of Foot with anatomy	Understands the material	7	.1
Apply and test	Interactive	Toe radiography	Understands the material	7	.2
Apply and test	Interactive	Foot, AP, lateral, oblique, shown structure	Understands the material	7	.3
Apply and test	Interactive	Ankle joint, AP, lateral, oblique, oblique & AP with inversion	Understands the material	7	.4
Apply and test	Interactive	Ankle joint pathology	Understands the material	7	5
Apply and test	Interactive	Leg radiography Tibia & fibula, AP, Lateral	Understands the material	7	6
Apply and test	Interactive	Mid exam	Understands the material	7	7
Apply and test	Interactive	Knee joint AP, lateral, skyline for, erect AP	Understands the material	7	8
Apply and test	Interactive	Patella radiography	Understands the material	7	9
Apply and test	Interactive	Intercondylar fossa radiography	Understands the material	7	10
Apply and test	Interactive	Femoral radiography	Understands the material	7	11
Apply and test	Interactive	hip joint, AP, lateral	Understands the material	7	12
Apply and test	Interactive	frog-leg infro -superior view shown structure	Understands the material	7	13
Apply and test	Interactive	pelvic pathology,	Understands the material	7	14
Apply and test	Interactive	Final exam	Understands the material	7	15

12. Infrastructure

1- Required prescribed books	Training bag
2- Main references (sources)	1. Whitley, A. S., Jefferson, G., Holmes, K., Sloane, C., Anderson, C., & Hoadley, G. (2015). <i>Clark's Positioning in Radiography</i> 13E. crc Press. 2. Bontrager, K. L., & Lampignano, J. (2013). <i>Bontrager's handbook of radiographic positioning and techniques</i> . Elsevier Health Sciences.
A-Recommended books and references (scientific journals, reports,...)	chapman & nakielny's guide to radiological procedures (eight edition)
B - Electronic references, Internet sites...	Radiopedia.org

13. Course development plan
The curriculum development plan is based on the following: 1-Giving the prescribed scientific material and observing and analyzing the students' results 2-Study feedback from students' comments about vocabulary 3-Study the practical laboratory notes for the course 4-Comparing current vocabulary with the vocabulary of corresponding colleges in the field

special radiological examinations of the biliary and reproductive system course

Teaching students how to perform a radiological examination of the biliary and reproductive system using a conventional radiograph, ultrasound, helical scanner, and magnetic resonance imaging (and using contrast material designated for each examination).

1. Educational institution	Al-Ayen Iraqi University, College of Health and Medical Technologies
2. Scientific department/center	Department of Radiology Technologies
3. Course name/code	special radiological examinations of the biliary and reproductive system
4. Available forms of attendance	%100
5. Annual/ courses	Courses
6. Number of study hours (total)	2 theoretical hours + 5 practical hours = 7 hours x 15 weeks = 105 hours
7. Date this description was prepared	2024
8. Course objectives Teach students how to use contrast media and perform radiological examination of the biliary and reproductive systems	

10. Course outcomes and teaching, learning and evaluation methods
A- Cognitive objectives 1. Use appropriate materials for X-ray coloring and in appropriate amounts. 2. Knowledge and understanding of the human anatomy and its functions. 3. Learn methods of medical imaging of the biliary and reproductive systems. 4. Reasons, contraindications, complications, and method of examining the liver, gallbladder, and bile ducts using ultrasound. 5. Indications, contraindications, complications, and method of examining the liver, gallbladder, and bile ducts using a helical microscope. 6. Reasons, contraindications, complications, and method of

examining the liver, gallbladder, and bile ducts using magnetic resonance imaging. 7. Examination of the gallbladder and bile ducts during and after the operation. 8. Learn methods of medical imaging of the urinary system. 9. Examination of the urinary system using conventional x-rays and a special colored substance. 10. Examination of the sewage and urinary system with a spiral microscope. 11. MRI examination of the urinary system. 12. Coloring the uterus and fallopian tubes using x-rays and dye. 13. Methods of examining the male and female reproductive system. 14. Examination of the reproductive system using a helical microscope. 15. Examination of the reproductive system using MRI.	
B - The skills objectives of the course. 1. Teaching the student how to use coloring matter and conduct radiological examination of various body systems. 2. Preparing efficient cadres to meet the needs of educational institutions in general and the health sector in general private. 3. Availability of qualified personnel to work in the field of teaching and imaging examinations in hospitals Governmental and private centres. 4. Exchanging scientific expertise and competencies with similar laboratories in other universities and colleges.	
Teaching and learning methods	
• Lectures • Video clips	
Evaluation methods	
1. Written exams every week. 2. Daily oral evaluation. 3. Semester exams.	
D - General and qualifying transferable skills (other skills related to employability and personal development). • Learn how to protect against radiation and its harms. • Learn how to deal with the patient during radiological examinations. • Learn about the use of medical imaging techniques (sonography, helical scanner, and magnetic resonance imaging). • Directing and advising patients to prepare them before undergoing medical	

imaging (preparing and introducing the patient to the examination)

- Learn about using modern devices and updating student information as these devices develop.
- Preparing the student to be a faculty member in the future.

11. Course structure

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Apply and test	Interactive	• Methods of imagines of hepatobiliary system .	Understands the material	7	.1
Apply and test	Interactive	• U/S of the liver, gallbladder and biliary system .	Understands the material	7	.2
Apply and test	Interactive	• CT for the liver biliary tree.	Understands the material	7	.3
Apply and test	Interactive	• MRI of the liver .	Understands the material	7	.4
Apply and test	Interactive	• Intraoperative & postoperative T-tube, cholangiography.	Understands the material	7	5
Apply and test	Interactive	• Biliary drainage .	Understands the material	7	6
Apply and test	Interactive	• Methods of imagines of urinary tracts . • Excretion urography.	Understands the material	7	7
Apply and test	Interactive	• CT urinary tract.	Understands the material	7	8
Apply and test	Interactive	• Magnetic MRI of the urinary tract.	Understands the material	7	9
Apply and test	Interactive	• Micturition cystourethrography . • Ascending Urethrography in the male.	Understands the material	7	10
Apply and test	Interactive	• Methods of imagines of male & female reproductive system.	Understands the material	7	11
Apply and test	Interactive	• Hysterosalpingography .	Understands the material	7	12
Apply and test	Interactive	• CT of the reproductive system.	Understands the material	7	13
Apply and test	Interactive	• MRI of the reproductive system.	Understands the material	7	14
Apply and test	Interactive	• Magnetic MRI of the urinary tract.	Understands the material	7	15

12. Infrastructure	
1- Required prescribed books	Training bag
2- Main references (sources)	1. Watson, N. & Jones, H. chapman& Nakielnys <i>“Guide to Radiological procedures”</i> , 7 th edition, Elsevier Health Sciences, 2017.
A-Recommended books and references (scientific journals, reports,...)	chapman & nakielny’s guide to radiological procedures (eight edition)
B - Electronic references, Internet sites...	Radiopedia.org

13. Course development plan
The curriculum development plan is based on the following: 1-Giving the prescribed scientific material and observing and analyzing the students’ results 2-Study feedback from students’ comments about vocabulary 3-Study the practical laboratory notes for the course 4-Comparing current vocabulary with the vocabulary of corresponding colleges in the field

Radiographic anatomy of the lower extremities course

The student should be able to identify the body parts of the lower extremities that appear in the x-ray.

1. Educational institution	Al-Ayen Iraqi University, College of Health and Medical Technologies
2. Scientific department/center	Department of Radiology Technologies
3. Course name/code	Radiographic anatomy of the lower extremities
4. Available forms of attendance	%100
5. Annual/ courses	Courses
6. Number of study hours (total)	2 theoretical hours + 4 practical hours = 6 hours x 15 weeks = 90 hours
7. Date this description was prepared	2024
8. Course objectives 1. Preparing and qualifying radiology technicians with scientific knowledge and professional skills so that they are able to solve health problems in the field of radiology techniques. 2. Developing and encouraging the field of scientific research using research results and applications	

10. Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives 1- It teaches students to obtain knowledge and correct understanding of the anatomical parts of the human body. 2- It teaches students how to read a radiograph and know its anatomical parts. 3- It teaches students to obtain knowledge and understanding of the dangers of radiation and its long-term impact.
B - The skills objectives of the course. 1. Teaching students the anatomical parts of the human body, especially the skull area, upper limbs, and lower limbs. 2. Teaching students how the anatomical parts of the human body appear on a radiograph.
Teaching and learning methods
• Lectures • Video clips
Evaluation methods
1. Written exams every week. 2. Daily oral evaluation. 3. Semester exams.
D - General and qualifying transferable skills (other skills related to employability and personal development). • The graduate will be able to correctly examine the anatomical part required of him • The graduate will be able to keep pace with developments in diagnostic radiology devices

11. Course structure					
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Apply and test	Interactive	Bony pelvis	Understand s the material	6	.1
Apply and test	Interactive	pelvis male &female iffrencesd	Understand s the material	6	.2
Apply and test	Interactive	femure of ranatomy	Understand s the material	6	.3
Apply and test	Interactive	bone tibia anatomy	Understand s the material	6	.4
Apply and test	Interactive	bone fibula anatomy	Understand s the material	6	5
Apply and test	Interactive	bone foot anatomy	Understand s the material	6	6
Apply and test	Interactive	features radiological bone foot of	Understand s the material	6	7
Apply and test	Interactive	of capsule &ligaments joint hip	Understand s the material	6	8
Apply and test	Interactive	of features radiological joint hip	Understand s the material	6	9
Apply and test	Interactive	knee of anatomy	Understand s the material	6	10
Apply and test	Interactive	features radiological knee of	Understand s the material	6	11
Apply and test	Interactive	ankle of anatomy	Understand s the material	6	12
Apply and test	Interactive	lower of supply blood limbs	Understand s the material	6	13
Apply and test	Interactive	features radiological arteries of	Understand s the material	6	14
Apply and test	Interactive	features radiological veins of	Understand s the material	6	15

12. Infrastructure	
1- Required prescribed books	Training bag
2- Main references (sources)	1. Kelley, L. L., & Petersen, C. (2018). <i>Sectional Anatomy for Imaging Professionals</i>. Third & fourth edition. 2. Ryan, S., McNicholas, M., & Eustace, S. (2011). <i>Anatomy for diagnostic imaging</i>. 3. Lazo, D. L. (2015). <i>Fundamentals of sectional anatomy: an imaging approach</i>
A-Recommended books and references (scientific journals, reports,...)	Studies published on pubmed and scopus
B - Electronic references, Internet sites...	Radiopedia.org

13. Course development plan
The curriculum development plan is based on the following: 1-Giving the assigned scientific material and observing the students' results. 2-Study the practical laboratory notes for the course 3-Comparing current vocabulary with the vocabulary of corresponding colleges in the field