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

Traditional radiation equipment techniques Course

This course deals with the study of traditional radiological devices used in the field of radiography and medical examination and learning how these devices work.

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	Traditional radiation equipment 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. Identify the components of the X-ray system operating unit 2. Explain the operation of a high voltage generator 3. Identify the basic components of an X-ray tube 4. Explain the types of important technologies in X-ray imaging systems 5. 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 all traditional radiological devices and how they work

B - The skills objectives of the course.

The student has the ability to know modern techniques in developing traditional devices

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).

- Teaching the student how to deal with all radiological devices.
- Teaching students the skills of using x-ray machines

11. Course structure					
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the wee k
Apply and test	Interactive	x-ray machine system	Understands the material	7	.1
Apply and test	Interactive	High voltage generators	Understands the material	7	.2
Apply and test	Interactive	x-ray tube	Understands the material	7	.3
Apply and test	Interactive	x-ray tube failure	Understands the material	7	.4
Apply and test	Interactive	Construction of film	Understands the material	7	5
Apply and test	Interactive	Filter	Understands the material	7	6
Apply and test	Interactive	Grid types	Understands the material	7	7
Apply and test	Interactive	Digital radiography	Understands the material	7	8
Apply and test	Interactive	Direct to digital radiography	Understands the material	7	9
Apply and test	Interactive	Imagequality	Understands the material	7	10
Apply and test	Interactive	Mammography	Understands the material	7	11
Apply and test	Interactive	Digital Mammography	Understands the material	7	12
Apply and test	Interactive	Fluoroscopy	Understands the material	7	13
Apply and test	Interactive	Bone density scan	Understands the material	7	14
Apply and test	Interactive	Orthopantogram	Understands the material	7	15

12. Infrastructure	
1- Required prescribed books	Training bag
2- Main references (sources)	1. Stewart Carlyle Bushong, *"Radiologic Science for Technologists Physics, Biology, and Protection"* Elsevier, Inc. , 7th edition, 2017. 2. Chris Guy & Dominic ffytche, *"An Introduction to The Principles of Medical Imaging"* , Imperial College Press, 2005. 3. Perry Sprawls, *"Physical principles of medical imaging"*, 2nd Edition 1996.
A-Recommended books and references (scientific journals, reports,...)	Chris Guy & Dominic ffytche, *"An Introduction to The Principles of Medical Imaging"* , Imperial College Press, 2005.
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 head and upper extremities course

The student should be able to identify the parts of the body 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 head and upper 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 an x-ray.

Teaching and learning methods

- Lectures
- Video clips

methods Evaluation

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	Normal anatomy of skull	Understands the material	6	.1
Apply and test	Interactive	Radiological features of the skull	Understands the material	6	.2
Apply and test	Interactive	Normal anatomy of facial bone	Understands the material	6	.3
Apply and test	Interactive	Radiological features of facial bone	Understands the material	6	.4
Apply and test	Interactive	Normal anatomy of nasal cavity & paranasal sinuses	Understands the material	6	5
Apply and test	Interactive	Scapuller radiological features & Ossification centers. The humerus : radiological features & ossification centers	Understands the material	6	6
Apply and test	Interactive	The clavicle: radiological features & Ossification centers. The humerus : radiological features & Ossification centers	Understands the material	6	7
Apply and test	Interactive	The radius & ulna: radiological features & ossification centers	Understands the material	6	8
Apply and test	Interactive	The hand: radiological features & ossification centers of carpal, metacarpal & phalanges	Understands the material	6	9
Apply and test	Interactive	The shoulder joint: components, radiological features of the shoulder joint	Understands the material	6	10
Apply and test	Interactive	The elbow joint: components, articulating surface radiological features	Understands the material	6	11
Apply and test	Interactive	The wrist joint: components, articulating surface, radiological features	Understands the material	6	12
Apply and test	Interactive	blood supply of upper limbs Arteries of the upper limb	Understands the material	6	13
Apply and test	Interactive	Radiological features of the upper limb arteries	Understands the material	6	14
Apply and test	Interactive	Veins of the upper limb, radiological features of the upper limb veins	Understands the material	6	15

12. Infrastructure	
1- Required prescribed books	Training bag
2- Main references (sources)	1. Kelley, L. L., & Petersen, C. (2018). ***Sectional Anatomy for Imaging Professionals***. Third & fourth edition. 2. Ryan, S., McNicholas, M., & Eustace, S. (2011). ***Anatomy for diagnostic imaging.*** ***3.*** Lazo, D. L. (2015). ***Fundamentals of sectional anatomy: an imaging approach***
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

Radiographic techniques of the upper extremities Course

	This course is concerned with studying imaging of all examinations of the upper 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 upper 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 upper extremities.	

10. Course outcomes and teaching, learning and evaluation methods
A- Cognitive objectives 1- Knowing and understanding radiography/examinations of the upper extremities, knowing the diseases related to them, and understanding the results of radiography to reach the most accurate radiography methods for them. 2- Knowing and understanding the imaging of joint examinations in the upper extremities, 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 in them. 3- Knowing and understanding the imaging of bones and fractures and their types

4- Knowing and understanding lung diseases, methods of diagnosing them, and reading their diagnostic images
5- Knowledge of the operation of the X-ray machine

B - The skills objectives of the course.
1 - Photographing all examinations of the upper extremities
2- Imaging all general lupus examinations
3 - Study radiological interpretations to arrive at correct imaging and diagnosis methods

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 seriousness and continuous interest of the professor makes the student attracted to the academic subject
- Continuous follow-up and use of modern means to deliver scientific material to the student
- Enabling students to understand the suffering and pain of patients and how to provide assistance to them

11. Course structure					
Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Apply and test	Interactive	• Terminology, body planes, section, lines, body position special projections,	Understands material the	**7**	**.1**
Apply and test	Interactive	• Image quality, exposure factor, brightness, contrast, resolution, distortion, noise	Understands the material	**7**	**.2**
Apply and test	Interactive	• Upper limb, hand, wrist, Scaphoid bone AP, lateral position, shown structure	Understands the material	**7**	**.3**
Apply and test	Interactive	• Hand radiography	Understands the material	**7**	**.4**
Apply and test	Interactive	• wrist radiography	Understands the material	**7**	**5**
Apply and test	Interactive	• Humerus distal and fracture	Understands the material	**7**	**6**
Apply and test	Interactive	• Forearm, radius and ulna, type of fracture	Understands the material	**7**	**7**
Apply and test	Interactive	• Humerus proximal fracture	Understands the material	**7**	**8**
Apply and test	Interactive	• Scapula distal and proximal fracture	Understands the material	**7**	**9**
Apply and test	Interactive	• Scapula radiography	Understands the material	**7**	**10**
Apply and test	Interactive	• Elbow joint, AP, Lateral, oblique, shown structure	Understands the material	**7**	**11**
Apply and test	Interactive	• Shoulder joint, AP, lateral, supero - inferior & oblique	Understands the material	**7**	**12**
Apply and test	Interactive	• Shoulder joint, pathology	Understands the material	**7**	**13**
Apply and test	Interactive	• Mid exam	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). ***Clark's Positioning in Radiography*** 13E. crc Press. 2. Bontrager, K. L., & Lampignano, J. (2013).

	***Bontrager's handbook of radiographic positioning and techniques*.** 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 digestive system and bones course

Teaching students how to use contrast media and conduct a radiological examination of the digestive system and bones using a conventional radiograph, ultrasound, helical scanner, and magnetic resonance imaging (and using the 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 digestive system and bones
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 digestive system and bones	

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. Learn medical imaging of the digestive system and the appropriate color material. 3.Knowing and understanding the human anatomy and its functions. 4. Reasons, contraindications, and complications of examining the esophagus using x-rays and the appropriate contrast material. 5. Reasons, contraindications, and complications of examining the stomach using x-rays and the appropriate contrast material. 6. Reasons, contraindications, and complications of examining the small intestine using x-rays and the appropriate contrast material. 7. Reasons, contraindications, and complications of examining the large intestine using x-rays and the appropriate contrast material. 8. Examination and treatment of intestinal obstruction

9. Examination of the digestive system using ultrasound and MRI techniques.
10. Examination of bones and joints using magnetic resonance imaging.
11. Bone examination using radioactive isotopes.

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	• Intravascular contrast media • Adverse effect of Intravenous (IV) water soluble contrast media	Understands the material	**7**	**.1**
Apply and test	Interactive	• Contrast Agents in Magnetic Resonance Imaging	Understands the material	**7**	**.2**
Apply and test	Interactive	• Methods of imaging of Gastrointestinal tract (GIT) with barium water soluble contrast agents	Understands the material	**7**	**.3**
Apply and test	Interactive	• Barium examination: swallow and meal • Barium examination: follow through, small bowel anema .	Understands the material	**7**	**.4**
Apply and test	Interactive	• Barium examination: barium enema instant enema air enema.	Understands the material	**7**	**5**
Apply and test	Interactive	• Reduction of intussusception	Understands the material	**7**	**6**
Apply and test	Interactive	• Computed Tomography of the Gastrointestinal Tract	Understands the material	**7**	**7**
Apply and test	Interactive	• Magnetic Resonance Imaging of the Gastrointestinal Tract	Understands the material	**7**	**8**
Apply and test	Interactive	• Imaging modalities of bones & joints.	Understands the material	**7**	**9**
Apply and test	Interactive	• Musculoskeletal MRI	Understands the material	**7**	**10**
Apply and test	Interactive	• Arthrography — general points	Understands the material	**7**	**11**
Apply and test	Interactive	• Arthrography of the knee & hip	Understands the material	**7**	**12**
Apply and test	Interactive	• Arthrography of the shoulder & bow	Understands the material	**7**	**13**
Apply and test	Interactive	• Arthrography of the wrist & ankle	Understands the material	**7**	**14**
Apply and test	Interactive	• Radionuclide bone scan	Understands the material	**7**	**15**

12. Infrastructure

1- Required prescribed books	Training bag
2- Main references (sources)	1. Watson, N. & Jones, H. chapman& Nakielnys *''Guide to Radiological procedures''* , 7th 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-Increase scientific courses and workshops 2- Application within health institutions 3- Sending top performers to courses outside the country 4- Participate in post-graduation training courses in an advanced training center and keep pace with development in the specialty. 5- Opening postgraduate studies in specific specializations. 6- Participation in international and local conferences.

Basics of radiation protection1 course

Radiation protection is the science of protecting humans from the effects of ionizing radiation, whether they are elementary particles such as protons and neutrons or high-energy electromagnetic radiation such as X-rays and gamma rays.

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	Basics of radiation protection1
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. The student obtains valuable information in the subject of theoretical radiation protection and applies it in the laboratory in preparation for benefiting from it in the specialty.
2. Use the information that the student was trained on in the laboratory and link it to his specialty, especially in places that contain sources of radiation, such as hospitals, the nuclear medicine unit, and other centers.
3. This course description provides a summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he or she has made the most of the learning opportunities available. It must be linked to the program description.
4. Achieving the best level of safety and security for individuals and the environment and ensuring that peaceful applications of radioactive sources are a source of modern technology for the sake of human well-being without exposing them to any risks that may result from these applications. This is done by providing sufficient information and guidance to officials and workers in various fields of ionizing radiation about the principles and preventive methods that must be followed when dealing with ionizing radiation.

10. Course outcomes and teaching, learning and evaluation methods

A- Cognitive objectives

First, gain knowledge about an important scientific topic

1. Applying it in his field of work
2. He obtains new ideas that can be combined with his specialty

B - The skills objectives of the course.

B1. Developing the student from the practical aspect in the laboratory and the theoretical aspect in understanding the basics of radiation protection

B2. Solve the problems facing the student in the field of work by developing his mind in thinking to solve the problem

B3. The student learns how to write scientific reports

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 seriousness and continuous interest of the professor makes the student attracted to the academic subject
- Continuous follow-up and use of modern means to deliver scientific material to the student
- Enabling students to understand the suffering and pain of patients and how to provide assistance to themfuture.

11. Course structure

Evaluation method	Teaching method	Name of the unit/topic	Required learning outcomes	hours	the week
Apply and test	Interactive	• Classification of ionizing radiation • Sources of ionization Radiation (background radiation) – Natural sources – Human-made (artificial) sources • Comparison of Radiation Doses	Understands Subject Scholarship	theoretical + 3 2 practical	**.1**
Apply and test	Interactive	• Radiation Measurement Units & International SI Units – Activity – Exposure – Absorbed dose – Kerma – Equivlant dose – Effective dose – Committed Equivlant & effective dose	Understands Subject Scholarship	theoretical + 3 2 practical	**.2**
Apply and test	Interactive	• The Principles of Radiological Protection – Justification of a practice – Optimisation of Protection (ALARA principles) ❖ Time ❖ Distance ❖ Shielding	Understands Subject Scholarship	theoretical + 3 2 practical	**.3**
Apply and test	Interactive	– Dose limits – Maximum Permissible Occupational Doses – Maximum Permissible public Doses – Maximum Permissible patient Doses – Whole-Body Dose Limits	Understands Subject Scholarship	theoretical + 3 2 practical	**.4**
Apply and test	Interactive	• Radiation protection for classification of exposure: – Occupational – Medical – Public • Whole body non-occupational exposure • Partial-body occupational exposure	Understands Subject Scholarship	theoretical + 3 2 practical	**5**
Apply and test	Interactive	• Occupational Radiation Exposure in: – Fluoroscopy – Mammography – Computed Tomography – Surgery	Understands Subject Scholarship	theoretical + 3 2 practical	**6**
Apply and test	Interactive	• Patient Radiation Dose Descriptions – Entrance Skin Exposure (ESE) – Mean Marrow Dose (MMD)	Understands Subject Scholarship	theoretical + 3 2 practical	**7**
Apply and test	Interactive	• Dose and management principles in Special cases: – X-ray and pregnancy ❖ Pregnancy patient ❖ Pregnancy technologist – X-ray and obesity ❖ Obese patient ❖ Obese technologist	Understands Subject Scholarship	theoretical + 3 2 practical	**8**
Apply and test	Interactive	• Design of Protective Barriers in X-Ray Installations – Design of Primary Protective Barrier – Design of Secondary Protective Barrier ❖ Leakage Radiation ❖ Scattered Radiation	Understands Subject Scholarship	theoretical + 3 2 practical	**9**
Apply and test	Interactive	• Factors That Affect Barrier Thickness	Understands Subject	theoretical + 3 2 practical	**10**

			Scholarship		
Apply and test	Interactive	• **Radiation Detection and Measurement** – **Ionization gases detectors (Gas-Filled Detectors)** ❖ **Geiger Counters** ❖ **Proportional counting** ❖ **Ion Chambers**	Understands Subject Scholarship	theoretical + 3 2 practical	**11**
Apply and test	Interactive	– **Scintillation detectors** ❖ **Organic Scintillators** ❖ **Inorganic Scintillators** – **Semiconductor Detectors** • **Instrument Calibration**	Understands Subject Scholarship	theoretical + 3 2 practical	**12**
Apply and test	Interactive	• **Personnel Dosimeters** – **Film Badges** – **Thermoluminescence Dosimeters (TLDs)** – **Optically stimulated luminescence (OSL)** – **Pocket Dosimeters** – **Direct Ion Storage (DIS)** – **Radiophotoluminescence** – **Electronic personal dosimeter (MOSFET dosimeters)**	Understands Subject Scholarship	theoretical + 3 2 practical	**13**
Apply and test	Interactive	• **CT Dose Metrics and Calculation** – **CT dose index (CTDI)** – **dose-length product(DLP)**	Understands Subject Scholarship	theoretical + 3 2 practical	**14**
Apply and test	Interactive	• **Fluoroscopy dose:** – **To patient** – **To staff** • **methods of minimizing fluoroscopy dose**	Understands Subject Scholarship	theoretical + 3 2 practical	**15**

12. Infrastructure	
1- Required prescribed books	Stewart C. Bushong , Sc.D., FACR,FACMP Houston, Texas "Radiologic Science for Technologists" , Fifth edition, 1993. P.A. Robert, J. Williamas, Europe “Farr’s Physics for medical imaging” second edition.
2- Main references (sources)	Factors affecting patient dose in diagnostic radiology , J L Poletti / NRL Report. RADIATION HEALTH SERIES GUIDANCE NOTES ON RADIATION PROTECTION FOR DIAGNOSTIC RADIOLOGY Radiation Health Unit / Department of Health. Radiation Protection 136 European guidelines on radiation protection in dental radiology The safe use of radiographs in dental practice.

	Directorate-General for Energy and Transport Directorate H — Nuclear Safety and Safeguards Unit H.4 — Radiation Protection 2004
A-Recommended books and references (scientific journals, reports,...)	Physics of diagnostic imaging for medical students. James E. Martin Physics for Radiation Protection. A Handbook. James E. Martin Copyright _ 2006 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim ISBN: 3-527-40611-5 Nuclear Science—A Guide to the Nuclear Science, Wall Chart ©2003 Contemporary Physics Education Project (CPEP)
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

Fundamentals of radiation physics course

It specializes in the study of dental rays in terms of their origin, methods, generation, interaction of rays with matter, the human body, their dangers, and how to deal with them. It specializes in a theoretical study of the basics of X-ray 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	Fundamentals of radiation physics
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 X-rays, the interaction processes between X-rays, and identifying the factors affecting the electron beam. 2. Determine the factors affecting the output of x-rays and x-ray images.	

10. Course outcomes and teaching, learning and evaluation methods
A- Cognitive objectives 1- A deep understanding of X-Ray diagnosis and treatment 2-Understanding the science of growth and development in X-Ray. 3- The ability to deal with modern devices and technologies 4- Responding to recent developments in the field of X-Ray

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
Teaching and learning methods
1- leactures 2- video clips
Evaluation methods
1. Written exams every week. 2. Daily oral evaluation. 3. Semester exams.
C- Emotional and evaluetion objectives c1 - the student shoud 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 shoud 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 wee k
Test and apply	Interactive	Generating the tube voltage , Exposure timing , Falling load , Filament voltage	Understands the material	**5**	**.1**
Test and apply	Interactive	Limitation of the x-ray tube , Line focus Rotation anode tube , Heat rating	Understands the material	**5**	**.2**
Test and apply	Interactive	X-Ray Tube Heating and Cooling Heat Factors •production Heat capacity affecting the heat capacity Focal spot area Focal spot size Rotating anode speed Anode body	Understands the material	**5**	**.3**
Test and apply	Interactive	X-Ray Production Characteristic radiation Emission •Bremsstrahlung radiation Bremsstrahlung •spectrum Importance in Imaging and Dose Influence of Electron Energy	Understands the material	**5**	**.4**
Test and apply	Interactive	Influence of Filtration Characteristic Radiation Importance in Imaging and Dose Influence of Electron Energy Influence of Target Material Influence of Filtration	Understands the material	**5**	**5**
Test and apply	Interactive	Luminescence phenomenon X-ray fluorescence -X-ray phosphorescence	Understands the material	**5**	**6**
Test and apply	Interactive	Electron tube energy Added Filtration Factors affecting electron emission spectrum mA and MAS KVp Voltage Waveform Target Material	Understands the material	**5**	**7**
Test and apply	Interactive	X-ray Emission: Factors Influencing x-ray spectra and output X-ray quantity X-ray intensity Factors affecting x-ray quantity	Understands the material	**5**	**8**
Test and apply	Interactive	X-ray quality Penetrability Photon range filteration	Understands the material	**5**	**9**
Test and apply	Interactive	The Linear X-ray Attenuation Coefficient Interaction X-ray with matter processes • Photoelectric Absorption Unmodified scatter	Understands the material	**5**	**10**
Test and apply	Interactive	actors affecting image contrast Linear attenuation coefficient of subject Soft Tissue -Photon energy (KVp Calcium Radiography Iodine and Barium Contrast Media Scatter Radiation and Contrast-	Understands the material	**5**	**11**
Test and apply	Interactive	Attenuation of X-ray by The patient Contrast media	Understands the material	**5**	**12**
Test and apply	Interactive	Differential absorption Dependence on Atomic Number Dependence on Mass density	Understands the material	**5**	**13**

Test and apply	Interactive	X-ray tube output factors X-ray tube kilovoltage -output milliampere-seconds automatic exposure control Filtration Focal spot measurement	Understands the material	**5**	**14**
Test and apply	Interactive	Equipment tests Speed of film processor	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