

MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL
(Formerly West Bengal University of Technology)
Syllabus of B. Sc. in Radiology & Imaging Technology
(Effective from 2024-25 Academic Sessions)

Semester-IV

Subject Name: EQUIPMENTS FOR MEDICAL IMAGING

Mode: Offline
BMMIT 4201

Credits: 4

Aim of the Course: Aims to introduce students to medical imaging equipment

Course Objectives: To provide basic knowledge of medical imaging equipment, including their types, functions, and clinical applications, along with maintenance and troubleshooting techniques.

Sl	Graduate attributes	Mapped modules
CO1	Understand radiation principles and safety in clinical settings.	M1
CO2	Gain skills in operating and maintaining X-ray equipment.	M2
CO3	Apply image quality techniques to optimize diagnostic results.	M3
CO4	Master digital imaging techniques and related systems	M4
CO5	Develop expertise in portable and advanced imaging technologies.	M5

Learning Outcome/Skills: To impart basic knowledge about the following

- Understand the principles of radiation and atomic structure
- Demonstrate the ability to operate and maintain X-ray tubes and generators effectively, ensuring safe and optimal function.
- Apply techniques to control image quality and restrict the X-ray beam, enhancing diagnostic accuracy and minimizing patient exposure.
- Utilize digital radiology technologies and supporting systems, including CR, DR, and PACS
- Operate portable and advanced imaging equipment such as X-ray, CT, MRI, and USG machines

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Detailed Syllabus

MODULE 1: Basics of Radiation and Atomic Structure

1. Structure of Atom: Atomic number, mass number, isotopes, and radioisotopes.
2. Binding energy, quantum levels, and electromagnetic spectrum.
3. X-ray Production: Cathode rays, characteristic, and Bremsstrahlung radiation.
4. Interaction of X-rays with matter, inverse square law, and radiation measurement units.

MODULE 2: X-ray Tubes and Generators

1. X-ray Tube: Construction, cathode, anode, stationary, and rotating anode tubes.
 - Thermionic emission, line focus principle, and heel effect.
2. X-ray Generators: Types transformers, and rectifiers.
3. Circuits and Control Systems

MODULE 3: Image Quality and Beam Restriction

1. Beam Restrictors, Grids, Filters and Filtration.
2. Image Quality, penumbra, fluoroscopy, and IITV (Image Intensifier).

MODULE 4: Digital Radiology and Supporting Systems

1. Digital X-ray: CR, DR, tele-radiology, PACS.
2. Supporting Systems: Cassette, screens, Manual film processing, and automatic processors
3. Digital Detectors: Photostimulable phosphors and radiographic image production.

MODULE 5: Portable and Advanced Imaging Equipment

1. Portable X-ray Machines and Mammography.
2. **CT Equipment:** Principle, components (gantry, detectors), and applications.
3. **MRI Equipment:** Principle, components (magnet, gradient, RF coils), and applications.
4. **USG Equipment:** Principle, components (transducer, display unit), and applications

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Subject Name: Medical Terminology and patient care in diagnostic Radiology

Mode: Offline
BMMIT 4202

Credits: 4

Aim of the Course: aims to develop the knowledge and ensure effective communication and safe care in diagnostic radiology through mastery of medical terminology and patient-centered practices.

Course Objectives: To equip students with essential medical terminology and patient care skills for safe and effective diagnostic radiology practice.

Sl	Graduate attributes	Mapped modules
CO1	Master radiology-specific terminology for clear interaction and documentation.	M1
CO2	Demonstrate expertise in radiographic positioning, movements, and interventional procedures.	M2
CO3	Provide safe, compassionate, and effective care during radiological procedures.	M3
CO4	Adhere to radiation safety, infection control, and ethical standards.	M4
CO5	Effectively communicate procedures and ensure informed patient consent.	M5
CO6	Exhibit responsibility, adaptability, and a commitment to ongoing learning.	M6

Learning Outcome/Skills:

- Master radiology terms for accurate communication and documentation
- Apply radiographic positioning and movement techniques effectively.
- Ensure safe, ethical, and patient-centered care during procedures.
- Adhere to radiation safety and infection control protocols.
- Educate patients about procedures and ensure informed consent.
- Perform patient transfer, IV administration, and sterile techniques proficiently.

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Module Number	Content	Total Hours	% of questions	Bloom Level (applicable)	Remarks, if any
THEORY					
M1	Common Radiology Terminology	6	12	1,2,3	NA
M2	Radiographic Positioning and Movements	8	18	1,2,3	NA
M3	Interventional Radiology Terms	6	14	1,2,3	NA
M4	Interventional Radiology Terms	8	16	1,2,3	NA
M5	General Patient Care	10	20	1,2,3,4	NA
M6	Patient education and communication	12	20	1,2,3,4	
Total Theory		50			
TOTAL		50	100		

Unit 1: Medical Terminology for Radiology

Module 1: Common Radiology Terminology

- Anatomical terms: anterior, posterior, superior, inferior, medial, lateral, proximal, distal, superficial, deep.
- Planes of the body: axial, sagittal, coronal.
- Body positions: supine, prone, lateral, Trendelenburg, decubitus.

Module 2: Radiographic Positioning and Movements

- Terms for positioning: AP, PA, lateral, oblique, tangential projections.
- Movements: flexion, extension, abduction, adduction, pronation, supination.

Module 3: Interventional Radiology Terms

- Techniques: Ablation, embolization, balloon angioplasty.
- Equipment: Catheters, stents, wires.
- Imaging modalities: Fluoroscopy, CT, MRI, ultrasound.

Module 4: Patient Care Basics in Radiology

- Responsibilities of healthcare facilities and technologists.
- Patient preparation and positioning.
- Vital signs
- Radiation safety principles and informed consent.

Module 5: General Patient Care

- Patient transfer and restraint techniques.
- Ensuring patient comfort and security of belongings.
- Administering IV injections and laying out sterile trolleys.
- Infection Control and Sterilization
- Isolation techniques and infection sources.
- Transmission modes and sterile procedures.

Module 6: Patient education and communication

- Patient communication problems
- Explanation of examinations
- Radiation Safety / Protection Interacting with terminally ill patient
Informed Consent

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Subject Name: CLINICAL RADIOGRAPHY AND POSITIONING

Mode: Offline
BMMIT 4203

Credits: 3

Aim of the Course: To equip students with the knowledge and skills to perform accurate radiographic imaging and positioning while ensuring patient safety and comfort.

Course Objectives: To train students in accurate radiographic positioning, patient care, and safety practices, adhering to professional and ethical standards in clinical radiography.

Sl	Graduate attributes	Mapped modules
CO1	Demonstrate proficiency in basic and special projections of the upper and lower extremities for accurate imaging in trauma and non-trauma cases.	M1
CO2	Perform standard and trauma-specific projections of the pelvis, hip, and spine with clinical precision and adaptability.	M2
CO3	Execute chest and abdominal radiography with diagnostic accuracy while ensuring patient safety.	M3
CO4	Master specialized projections of the skull, cranial base, and facial bones to support accurate diagnosis.	M4
CO5	Adapt techniques and prioritize radiation safety to meet the unique needs of pediatric patients.	M5
CO6	Apply advanced skills in fluoroscopic procedures for gastrointestinal, urinary, and biliary imaging with clinical competence.	M6

Learning Outcome/Skills:

- Master radiology terms for accurate communication and documentation
- Apply radiographic positioning and movement techniques effectively.
- Ensure safe, ethical, and patient-centered care during procedures.
- Adhere to radiation safety and infection control protocols.
- Educate patients about procedures and ensure informed consent.
- Perform patient transfer, IV administration, and sterile techniques proficiently.

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Module Number	Content	Total Hours	% of questions	Bloom Level (applicable)	Remarks, if any
THEORY					
M1	Radiography of the Extremities	8	20	1,2,3	NA
M2	Radiography of the Pelvis and Spine	7	20	1,2,3,4	NA
M3	Radiography of the Chest and Abdomen	9	15	1,2,3,4	NA
M4	Radiography of the Skull and Facial Bones	8	15	1,2,3,4	NA
M5	Pediatric Radiography	5	10	1,2,3,4	NA
M6	Specialized Radiography and Fluoroscopy	8	20	1,2,3,4	NA
Total Theory		45	100		
<u>Practical</u>		30			
TOTAL		75			

Module 1: Radiography of the Extremities

1. Upper Extremity:

- Radiological anatomy.
- Basic and special projections for shoulder girdle, humerus, elbow, forearm, wrist, hand, fingers, and thumb.
- Trauma and non-trauma views.

2. Lower Extremity:

- Radiological anatomy.
 - Basic and special projections for femur, knee, leg, ankle, foot, and calcaneus.
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Module 2: Radiography of the Pelvis and Spine

1. Pelvic Girdle and Hip:

- Radiological anatomy.
- Projections: AP pelvis, frog-leg, inlet/outlet views, Judet method, and axiolateral projections.

2. Spinal Radiography:

- Cervical, thoracic, and lumbar spine anatomy.
 - Basic and trauma views: AP, lateral, oblique, scoliosis series, and sacroiliac joints.
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Module 3: Radiography of the Chest and Abdomen

1. Chest Radiography:

- Projections: PA, lateral, AP lordotic, decubitus views, and special projections for upper airway.

2. Abdominal Radiography:

- Radiological anatomy.
 - Projections: Supine (KUB), erect AP, lateral decubitus, and acute abdomen series.
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Module 4: Radiography of the Skull, Cranial, and Facial Bones

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1. Cranial Bones:

- Anatomy and projections for the skull base, sella turcica, and mastoids.

2. Facial Bones:

- Projections for orbits, nasal bones, TMJ, zygomatic arches, mandible, and sinuses.
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Module 5: Pediatric Radiography

- Positioning techniques for infants and children.
 - Radiation protection measures and patient care.
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Module 6: Specialized Radiography Fluoroscopic procedures

Fluoroscopic techniques, including gastrointestinal, urinary, and biliary procedures

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PRACTICAL

BMMIT 4293

PAPER NAME: LAB ON CLINICAL RADIOGRAPGY POSITIONING

Credit: 2

Total Hour:

- Demonstration Of Chest radiography trauma and non trauma cases.
- Demonstration
- To know management and positioning of patients while performing radiological positioning
- Knowledge of indications, contraindications contrast media, radiation dose, exposure timing and radiation safety measures for different radiological procedures.
- To understand the patient preparations needed before any radiological examination. Knowledge of post procedural care.