

**MAULANA ABULKALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL**  
**(Formerly West Bengal University of Technology)**  
**Syllabus of B. Sc Medical Imaging Technology**  
**(Effective from 2023-24 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.

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

**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

### 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.
  - o 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.

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

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

## **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.

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

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



## **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.