

**SYLLABUS OF BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY  
(B.M.R.I.T)**

**I<sup>ST</sup> YEAR**

Code No: MRT- 101

Max. Marks- 70

**PAPER I<sup>ST</sup>  
HUMAN ANATOMY**

**UNIT-I**

Introduction                      Scope of Anatomy.  
    Organization of Tissue.  
    Organs and systems.  
    Anatomical position of the body.  
    Axis and planes.

Bones-                              Classification development, parts of long bones and blood supply of bones.

Joints-                              Definition, classification, movements of different joint.

**UNIT-II**

**UPPER EXTREMITY**

Osteology-                      Clavicle, scapula, Humerus, Radius, ulna, carpals, metacarpals & Phalanges  
    Soft tissue- (Only Outline)  
  
    Breast, pectoral region, axilla, front & back of arm, front of forearm, back of forearm,  
    Palm, dorsum aspect of Hand.

Joints-                              Shoulder girdle, Shoulder joint, elbow joint, radio-ulnar joint, wrist joint and joints of  
    hand.

Surface measuring and Radiological Anatomy of upper limb.

## **UNIT –III**

### **LOWER EXTREMITY**

Osteology- Hipbone, Femur, Tibia, Fibula, Patella, Tarsals, Metarsals and Phalanges.

Soft tissue parts: Only outline.  
Glutela region, front and back of the thigh (femoral triangle, femoral canal and inguinal canal) medial side of the thigh (adductor canal). Lateral side of the thigh, popliteal fossa, Anterior and posterior compartment of leg, sole of the foot.

Joints- Hip joint, knee joint, ankle joints of the foot.

Surface Anatomy and Radiological Anatomy of Lower Limb.

## **UNIT-IV**

### **TRUNK**

- a) Osteology- Vertebra and ribs, sternum.
- b) Soft tissue- Vertebral muscles & intercostals muscles
- c) Joints- Costochondral, Costo vertebral, Intervertebral Joints.

### **HEAD AND NECK**

- a) –
- b) Osteology- Mandible and bones of skull.
- c) Joints- Temporomandibular Joints.

Surface and Radiological Anatomy of the Head & Neck.

## **UNIT –V**

### **THORAX**

- a) Pleura
- b) Lungs
- c) Mediastinum
- d) Pericardium
- e) Heart
- f) Trachea
- g) Oesophagus

Surface measuring and Radiological Anatomy of Thorax.

## **UNIT- VI**

### **ABDOMEN**

Soft Tissue- Only Outline

- a) Abdominal cavity & Peritoneum
- b) Stomach
- c) Intestine
- d) Spleen
- e) Pancreas
- f) Liver & Gall Bladder
- g) Kidney & Ureter, Urinary Bladder & Urethra
- h) Diaphragm
- i) Male & Female reproductive organs.
- j) Rectum & Anal Canal.

**II- Surface measuring and Radiological Procedure Used in the study of Abdominal Organs.**

### **NEURO ANATOMY**

- a) Meninges & C.S.F.
- b) Sulcuss & Gyrus and various areas of Cerebral Hemispheres.
- c) Thalamus, Hypothalamus and basal Ganglia.
- d) Cerebellum.
- e) Pons Medulla.
- f) Spinal Cord.
- g) IIIrd, IVth & Lateral Ventricles.
- h) Blood Supply of Spinal Cord & Brain.

Surface and Radiological Anatomy of Brain.

### **PRACTICALS**

- a) Surface measuring
- b) Ostiology.
- c) Identification of Anatomical structures with help of models, charts, CD Rom etc.

# **BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**

**(B.M.R.I.T)**

**I<sup>ST</sup> YEAR**

**PAPER 2<sup>ND</sup>**

Code No: MRT- 102

Max. Marks- 70

## **HUMAN PHYSIOLOGY**

### **UNIT-I**

#### **PHYSIOLOGY OF BLOOD AND CVS**

- a) Composition of Blood
- b) Function of RBC WBC
- c) BLOOD groups
- d) Circulation-General Principles
- e) Cardiac cycle and output
- f) E.C.G.

### **UNIT-II**

#### **RESPIRATORY SYSTEM**

- a) Mechanism of respiration- internal and external.
- b) Capacity and lung volumes.

#### **DIGESTIVE SYSTEM**

- a) Introduction to digestive system, Alimentary functional anatomy
- b) The Salivary glands
- c) The stomach and its secretion
- d) Intestine & its secretion
- e) Function of liver

### **UNIT-III**

#### **ENDOCRINAL SYSTEM**

General Principle of endocrinology

Thyroid

Parathyroid

## **SKIN**

Structure & function of Skin.

## **UROGENITAL SYSTEM**

- a) Physiology of Kidney and Urine formation
- b) Constituent of normal urine etc.
- c) Kidney function tests
- d) Physiology of Male and Female reproductive system.

## **UNIT-IV**

- a) Reflex arc.
- b) Physiology of the central nervous system.
- c) Physiology of the sympathetic and Parasympathetic nervous system.
- d) Function of Cerebrum, Cerebellum, basal ganglia, thalamus
- e) Hypothalamus, CSF and Blood brain barrier.

## **Practicals**

TLC

DLC

RBC

Blood Pressure

Reflexes- Superficial & Deep

Test for functions of cerebrum

Test for function of cerebellum

# **BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**

## **(B.M.R.I.T)**

### **I<sup>ST</sup> YEAR PAPER 3<sup>RD</sup>**

Code No: MRT-103

Max. Marks- 70

## **PREVENTIVE MEDICINE AND HEALTH CARE & PROTECTION AGAINST RADIOLOGICAL HAZARDS**

### **UNIT-I**

Water, air, and noise Pollution: Removal of water hardness, purification of water and standards of water quality. Air and Pollution and their prevention. Housing and air conditioning.

Hygiene and sanitation: Sanitation barriers, excreta disposal and disposal of hospital waste. Incineration and disinfection.

Infections and control: Microbial Pathogenecity, source and spread of infection in community, pathogenesis, toxigenicity, invasiveness, variations and virulence, host factors controlling infections to men, mode of spread and their control by physical & chemical agents.

### **UNIT-II**

Epidemiology: Epidemiology, surveillance and control of community infections. Role of laboratory in community and hospital infections. Emergence of drugs resistance. Methods of prevention and control- Isolation of patients, quarantine and incubation periods of various infectious diseases. Management of patients infectious disease hospital (IDH).

Prophylactic immunization: Rationale of immunization, immune response and duration of immunity, controlled studies of prophylactic Vaccines and hazards immunization. Various national immunization programs and vaccine schedule.

Reproductive, Family Planning & Child Health Care Programs.

### **UNIT- III**

1. Health care by balance diet and yoga: Normal constituents of diet, various diet programs, balanced diet and factors responsible for etiology of various nutritional disorders. Carcinogens in food, Role of regular exercise and yoga in prevention and management of various diseases.
2. Health Planning and Management: Health planning, Planning cycle, malaria eradication and various other national health policy and programs.

### **UNIT-IV**

Protection against Radio hazards

- General Principles & materials
- Departmental Protection
- Protection instruments & personnel monitoring.

# **BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**

**(B.M.R.I.T)**

**I<sup>ST</sup> YEAR**

**PAPER 4<sup>TH</sup>**

Code No: MRT-104

Max. Marks- 70

## **BASIC RADIATION PHYSICS**

### **UNIT-I**

#### **Fundamental of Physics**

Matter & Energy

Radiation & Spectra

Atoms & nuclei

Radioactivity

Electricity and Magnetism

### **UNIT-II**

Production

Properties

Measurement

Interaction of X-Rays-Gamma rays and electron radiation with matter and principles of different absorption in biological materials.

### **UNIT-III**

Control & Indicating devices

Roent gen & its measurements

Geiger-Muller & scintillation counters & Dosimeter

Absorbed does & RAD

Filter & Filtration.

# **BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**

**(B.M.R.I.T)**

**I<sup>ST</sup> YEAR**

**PAPER 4<sup>TH</sup>**

Code No: MRT-105

Max. Marks- 70

## **BASIC ORIENTATION OF RADIOGRAPHY & RADIOLOGY IMAGING**

### **UNIT-I**

1. The X-Ray machine.
2. X-Ray Production, Emission & Interactions with Matter.

### **UNIT-II**

1. Radiographic Film, Latent Image, Intensifying Screens, Grids.
2. Radiographic Exposure, Film Developing & Processing, Radiographic Quality.

### **UNIT-III**

Physical Principles of Diagnostic Ultrasound Piezoelectric effect, Acoustic Intensity, Reflection, Impedance & Absorption.

Ultra Sound Transducer, Beam Operational Modes & Biological effects.

### **UNIT-IV**

Compound Topography: Principles of operation System Components & Image Reconstruction

Physical Principles of Magnetic Resonance Imaging: Basic Concept, system Components,

Biological Hazards, Advantage over CT.

### **PRACTICAL BASED ON THEORY**



# **BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**

**(B.M.R.I.T) 2<sup>Nd</sup> Year**

Code No: MRT-201

Max. Marks- 70

## **PAPER I<sup>ST</sup> ORIENTATION IN PARACLINICAL SCIENCES**

### **UNIT-I**

#### **PARASITOLOGY**

Entamoeba Histolytica  
Leishmania  
Material Parasites of Man  
Helminthology  
Taenia Saginata  
Taenia Soleum  
Echinococcus Granulosvs  
Ascaris Lumbricoides  
Ancylostoma Duodenale  
Strongylids Stercoralis

### **UNIT-II**

#### **MICROBIOLOGY**

Morphology & physiology of Bacteria  
Staphylococcus  
Streptococcus  
Mycobacterium Tuberculosis  
Spirochetes  
Corneybacterium Diptheria

### **UNIT-III**

#### **VIRUS**

General Properties  
Herpes Virus  
Poliovirus  
Hepatitis Virus  
Oncogenic Virus  
HIV

## **UNIT-IV**

### **PATHOLOGY**

Inflammation  
Osteomyelitis  
Fractures  
Osteoporosis  
Rickets  
Osteomalacia  
Tumors of Bone  
Rheumatoid Arthritis  
Gout  
Osteoarthritis

## **UNIT-V**

### **PHARMACOLOGY**

Pharmacokinetics of Drugs

- Absorption
- Distribution
- Metabolism
- Excretion

Adverse drugs, reaction & Management

Pharmacology of different dyes used in Radiological Procedures.

**BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**  
**(B.M.R.I.T) 2<sup>ND</sup> Year**

Code No: MRT-202

Max. Marks- 70

**PAPER 2<sup>ND</sup>**  
**RADIATION PHYSICS INCLUDING RADIATION PROTECTION**

Atomic structure as applied to generation of X-Rays and radioactivity spectrum of diagnostic imaging and therapy X-Rays Effects of variation of tube voltage, current, filtration, III waveform and target material on X-Ray Production. Laws of radioactivity and decay schemes of different alpha, Beta, Gama ray, Artificial radio nuclide generators employed in medicine in general and radiotherapy sources in particulars, Interaction of radiation with matter attenuation absorption and scattering phenomena, Photoelectric absorption, Compton scattering, pair production and annihilation process, ionization effects of geometry absorber and on radiation quality. Transmission of x-ray through body tissues, Linear energy transfer. Range of secondary electrons and electron build up relative amounts of scatter from homogeneous and heterogeneous beam during the cones, diaphragm, collimators etc, units of radiation measurements specification of quality and half-value thickness (HVT) and its measurements, filters and filtration Measurement of radiation and dosimetric procedures. Radiation detectors and their principles of working. Definitions of Bragg-Peak, Percentage depth dose, Peak scatter, factor, tissue air-ratio, tissue maximum ratio, scaller air wedge angle, hinge angle, compensators, beams flatterer filters, scottering foils. Physical properties of phantoms, phantom materials, bolus and bolus substitutes. Factors used for treatment dose calculations, Daily treatment time and monitor units calculation method Physical aspects of electron and neutron therapy.

# **BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**

## **(B.M.R.I.T) 2<sup>Nd</sup> Year PAPER 3<sup>RD</sup>**

Code No: MRT-203  
Max. Marks- 70

### **BASIC RADIOGRAPHIC TECHNIQUES**

Skull: Radiography of cranial bones, cranium, sella, turcica, Orbit, optieformina, superior orbital fissure and inferior orbital fissure.

Facial Bones: Paranasal sinuses. Temporal bone. Dental Radiography, Radiography of teeth-intra oral, extraoral and occlusal view.

Abdomen: Preparation of patient, General. Acute positioning for fluid and air leaves. Plain film examination, Radiography of female abdomen to look for pregnancy. Macro radiography: Principal advantage, technique and applications.

Stereography- Procedure-presentation, for viewing, stereoscopes, steremetry. High KV technique principle and its applications. Soft tissue techniques, Mammography, Localization of bodies.

Ward mobile radiography: General precautions, Aspesis in techniques-Checking of mains supply and functions of equipment, selection of exposure factors, explosion risks. Radiation protection and rapid processing techniques.

### **PRACTICAL BASED ON THEORY**

# **BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**

**(B.M.R.I.T) 2<sup>Nd</sup> Year**

Code No: MRT-204

Max. Marks- 70

## **PAPER 4<sup>TH</sup>**

### **EQUIPMENTS FOR RADIOTHERAPY INCLUDING NEWER DEVELOPMENTS**

Orthovoltage equipment with special reference to physical design requirement of tube and its accessories and interlocks, gamma ray sources used in radiotherapy especially cobalt 60 source its construction and source housing and handling mechanism. Principles of isocentric tele-isotope machines megavoltage x-rays and electron beam accelerators and betatron. Salient features of components of linear Accelerator like tube design, wave guide, target design beam bending system. Radio-frequency generators klystron magnetron and linac basic principle of remote after-loading system/ machines for making casts Sterofoam template cutting system introduction to radio-surgery equipment and dosimetry equipment.

#### **PRACTICAL BASED ON THEORY**

**BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**  
**(B.M.R.I.T) 2<sup>Nd</sup> Year**

Code No: MRT-205  
Max. Marks- 70

**PAPER 5<sup>TH</sup>**  
**REGIONAL RADIOGRAPHY & RADIOLOGICAL PROCEDURES**

**REGIONAL RADIOGRAPHY**

Common terminology  
Radiography of each part positioning  
Patient handling & Preparation  
Drugs in X-Rays dept  
Clinical, Ethical & Legal Responsibility, (including medico legal /Accident cases)

**RADIOLOGICAL PROCEDURES**

Contrast media-Types, Properties, reaction & Treatments.  
Genitourinary system-IVU, MCU, RGU, HSG  
GI tract-Ba Swallow, Ba meal, Ba Follow through, Ba Enema, Small bowel enema, Double  
Contrast Enema Sialography.  
Biliary Tract-OCG, IVC, EPCP, PTHC, T-tube & Operative Cholangiography.  
Myelography

**DARK ROOM PROCEDURE.**

Sitting Lay out & fittings  
Cassette & Film Handling-Loading & Unloading, safe light.  
Manual & Automatic Processing-Practical Aspect.

**PRACTICAL BASED ON THEORY**

**BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**  
**(B.M.R.I.T) 3<sup>rd</sup> Year**  
**PAPER 1<sup>ST</sup>**

Code No: MRT-301  
Max. Marks- 70

**ORIENTATION IN CLINICAL SCIENCES**

(Only Outline i.e. Clinical features & Lab Investigation of the following conditions)

**UNIT-I**

**MEDICINE**

Pericarditis  
Valvular diseases  
Rhematic Heart Disease  
Heart failure

Chronic Bronchitis  
Emphysema  
Brochietasis  
Pneumonia  
Tuberculosis  
Pleura effusion  
Empyema  
Spntaneus Pheumothorax

**UNIT-II**

Achalsia Cardia  
Peptic ulcer  
Intestinal obstruction  
Crohns disease  
Ulcerative Colitis  
Pancreatitis  
Portal Hypertension  
Ascitis  
Cirrhosis  
Cholecyslitis

**UNIT-III**

UTI  
Glomerulonephritis  
Nephrotic syndrome  
Urinary Calculi  
Polysystic Kidney disease

Cerebral Vascular Dsorders  
Meningitis  
Encephalitis

## **UNIT-IV**

### **ORTHPAEDICS**

#### **Fracture**

Type Mechanism, Healing, Delayed Union, Non- complication

Injuries of the shoulder girdle, Dislocation of shoulder

# of Humerus, Elbow Forearm

Of Distal Radius & Ulna

Injuries of the Capus

Dislocation of Hip

# Femur, Tibia, Ankle, Calcaneum

Acute & chronic osteoarthritis

Rhematoid arthritis

Pagets Disease

Ankylosing spondylitis

Club foot

Bone Tumour- Benign, Malignant

## **UNIT-V**

### **Surgery**

Cholelithiasis

Peritonitis

Subphremic Abcess

Appendicitis

Hydronephrosis

Benign Hypertrophy prostatye

Sinusitis

### **OBSTRETRICS**

Diagnosis of Pregnancy

Normal Labour



**BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**  
**(B.M.R.I.T) 3<sup>RD</sup> Year**  
**PAPER 2<sup>ND</sup>**

Code No: MRT-302

Max. Marks- 70

**RADIOTHERAPY PLANNING AND QUALITY CONTROL &  
RADIATION THERAPY**

Definition of treatment planning. Planning procedure in general with special emphasis on tumour localization and target volume measurement by conventional radiographic method and simulator imaging. Role of special contrast medium base radiotherapy. CT/MR/Ultrasound/radionuclide imaging methods. Physical and clinical requirements of field secretion of treatment in Teletherapy Role of portal films in treatment planning. Chose of central axis percentage depth dose data and isodose curve from a spectrum of radiotherapy beams used for treatment. Requirement and practice of organ shielding single, multiple fields, pendulum and rotational field therapy, planning procedures. Computerized treatment planning system choice of dose, time and fraction. Safety of critical organs in planning methods. Role of treatment shell immobilization devices and later in patients set up and positioning.

Acceptance test on therapy simulator teleisope megavolgege-X-ray and electron beam machines.

Contribution of technologist in radiation calibration quality control assurances execution of radiation treatment.

**PRACTICAL BASED ON THEORY**

**BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**  
**(B.M.R.I.T) 3<sup>RD</sup> Year**  
**PAPER 3<sup>RD</sup>**

Code No: MRT-303

Max. Marks- 70

**EQUIPMENT OF RADIO-DIAGNOSIS ULTRASONOLOGY & CT SCANNING**  
**INCLUDING NEWER DEVELOPMENT AND QUALITY CONTROL.**

Special Radiology Equipment

- Image intensifier & TV Monitor
- Mammography
- Digital Radiography
- Pictorial archiving & Communication system (PACS)
- Computers in Radiology

Computed tomography: Historical developments, its principle and applications, various generators and definition of terms and cross sectional Anatomy.

Recent Developments in CT- Special CT (Triple phase CT study for hepatic & Pancreatic tumor, Multislice CT, Principles of CT Angio, CT guided biopsies & drainage

Diagnostic Ultrasound: Its principle applications and role in medicine Various types of transducers and definition terms and cross sectional anatomy.

Digital Radiography: Principle scanned projection radiography digital subtraction angiography application and definitions of terms.

M.R.I.: Principle, applications its advantage over computed tomography or ultrasonography. Its limitations and use and cross sectional anatomy.

Q.A. Programme i.e. Phases of development of radiological facility Q.A activities application in:-

1. Equipment selection phase.
2. Equipment installation of acceptance phase.
3. Operational phase.

**PRACTICAL BASED ON THEORY**

**BACHELOR OF MEDICAL RADIO IMAGING TECHNOLOGY**  
**(B.M.R.I.T) 3<sup>RD</sup> Year**  
**PAPER 4<sup>TH</sup>**

Code No: MRT-304

Max. Marks- 70

**SPECIAL RADIOGRAPHIC TECHNIQUES INCLUDING SPECIAL PROCEDURES**

Radiological procedures pertaining to salivary glands, lacrimal system, brochography arthrography and hysteron salpangiography various requirements trolley setup, indications and contra indications, contrast media used.

Ventriculography and encephalography- Technique, contrast media used, film sequence, indication contra indications.

Myelography: Technique, contrast media used injection of contrast media, indications and contraindications.

I.V.P and cytography etc.

Intra venou cholangiography T. tube: Cholangiography Preoperative cholangiography procedure contrast media indication & contra indications.

Double contrast Barium studies (small Bowel enema Ba enema etc) preoperative cholangiography procedure contrast media indications and contrast media used.

Angiography: Cerebral cardiac abdominal aortography general ennal and selective renal.

Splenoportovenography peripheral arterial and venous angiography precautions radiation Protection film charges manual automatic biplane film types large miniature cine contrast Media injection procedure and technique.

Interventional radiological procedures:

PTC, PTBD, ERCP, fine neddle aspiration cytology precutaneous nephrostomy.

Cardia Catherization embolization dilation etc.

**ICU- Radiography**

**PRACTICAL BASED ON THEORY**