DIPLOMA IN MEDICAL RADIOLOGY - DIAGNOSIS (**DMRD)**

SYLLABUS/COURSE CONTENT

A. BASIC RADIOLOGY

I. IMAGING TECHNIQUES AND MODALITIES :

1.1.1 Department Organisation: Digital Imaging and PACS
1.1.2 Digital Imaging and PACS : Picture Archiving and Communication System
1.1.3 Digital Imaging and PACS : what should a radiologist expect from PACS
1.1.4 Digital Imaging and PACS : Image processing in Computed Radiography
1.2 Intravascular Contrast Media
1.3 Whole body Computed Tomography : Recent Advances
1.4 Magnetic Resonance Imaging basic Principles
1.5 Ultrasound : general Principles
1.6 Radionuclide imaging
  1.6.1 Radionuclide Imaging : General Principles
  1.6.2 Radionuclide Imaging : Pediatric Nuclear Medicine
1.7 Dual Energy X-ray Absorptiometry
1.8 Functional and Physiological Imaging
1.9 Medicolegal issues in Diagnostic Radiology
1.10 Radiation Protection and patient doses in diagnostic radiology

II. RESPIRATORY SYSTEM :

1.1 **Techniques of Investigations :**
  1.1.1 Standard Techniques :
  1.1.2 Tomography : a) Conventional film Tomography
    b) Computed Tomography
  1.1.3 Digital Radiography
  1.1.4 Magnetic Resonance Imaging
  1.1.5 Radionuclide Imaging : a) Ventilation / Perfusion Scintigraphy
    b) Other thoracic scanning techniques
  1.1.6 Bronchography
  1.1.7 Ultrasound
  1.1.8 Angiography
  1.1.9 Lung Biopsy & Other Interventional Techniques.

1.2 **Normal Chest** :
  1.1.1 The Lungs (Radiological Anatomy & CT Terminology)
  1.1.2 The Central Airways
  1.1.3 The Lungs beyond Hila
  1.1.4 The Hila
  1.1.5 The Mediastinum : a) CT & MRI
    b) Plain film appearances
      i) The junctional lines :
      ii) The right Mediastinum above azygous vein
      iii) The left Mediastinum above Aortic arch

iv) The supra aortic Mediastinum on lateral view
v) The right Middle Mediastinum border below azygous arch.
vi) The left cardiac border below aortic arch
vii) The para spinal lines.
viii) The retrosternal line.

1.1.6 The Diaphragm

1.3 **Interpretation the Chest Radiograph** :

1.3.1 Identification o the Radiograph
1.3.2 Technical Consideration
1.3.3 Detection and Description of abnormalities : i) Silhouette Sie
ii) Alterations
iii) Consolidation
iv) Collapse
v) Nodular Opacities
vi) Ring Opacities
vii) Linear/Intestitial/Pleural /Chest Wall Opacities.
viii) Abnormal Transradiancy

1.4 **The Chest Wall, Pleura & Diaphragm** :

1.4.1 Chest Wall :
i) Soft tissue /Breasts
ii) Ribs /Sternum/Clavicle, Spine

1.4.2 The Pleura :
i) Normal Pleura
ii) Pleural Pathologies

1.4.3 The Diaphragm :
i) Height/Eventration / Movements/ Paralysis
ii) Hernias / Trauma/ Neoplasms

1.5 **The Mediastinum** :

1.5.1 Techniques :
1.5.2 Mediastinal Masses : i) Thyroid / Para Thyroid Masses / Thymic tumors/ Thymic hyperpalsia/ Teratoma / Germ cell Tumor.
ii) Mediastinal lymphadenopathy
iii) Neurogenic Tumors
iv) Extra medullary haematopoiesis / Mesenchymal Tumors/ Herniation of abdominal fat / Mediastinal lipomatosis / Aneusyrums.

1.5.3 **Differential Diagnosis :**
1.5.4 **Other Mediastinal Lesions : i) Acute / fibrosing Mediastinitis**

1.6 **Pulmonary Infections in Adults** :

1.6.1 Pneumonia :
1.6.2 Associated features and complications of pneumonia.
1.6.3 Pulmonary tuberculosis
1.6.4 HIV & AIDS

1.7 **Large Airway Obstruction** :

1.7.1 **Collapse :** General features / Collapse of individual lobes/ collapse of entire lung / segmental collapse/ Rounded atelectasis/ Non-obstructive collapse.

1.7.2 **Obstructive Pneumonitis / Bronchocele / Broncheictasis**

1.8 **Pulmonary lobar Collapse essential considerations** :

1.9 **Chronic inflow Obstruction** :

1.9.1 Asthama :

1.9.2 Choronic Bronchitis and Enphysema

1.9.3 Bronchiolitis

2.0 **Pulmonary Neoplasms** :

2.0.1 Bronchial Carcinomas

2.0.2 Benign Pulmonary Tumors

2.0.3 Malignant Lymphoma

2.0.4 Metastases

2.0.5 The solitary Pulmonary Nodule

2.1 **Diffuse Pulmonary Disease / Industrial Lung Disease / HRCT** :

2.1.1 Pulmonary Oedema :

2.1.2 Diffuse Pulmonary Haemorrhage

2.1.3 Inhalation of particulatematter

2.1.4 Diffuse Pulmonary Fibrosis

2.1.5 Sarcoidosis / Collagen Vascular Disease / Systemic Vasculitidis / Lymphoid Disorders of Lungs / Pulmonary Eosinophilia / Drug induced Lung Disease

2.2 **Chest Trauma** :

2.3 **Pulmonary Thromboembolism** :

2.3.1 Imaging Chest Radiography / Radionuclide Study / Pulmonary Arteriography / CT / MRI

2.4 **Post Operative & Critically ill Patients** :

2.4.1 Cardiopulmonary Disease

2.4.2 Post Thoracotomy Radiograph

2.4.3 Support and Monitoring apparatus

2.4.4 Radiation Therapy

2.5 **Chest Radiography after Lung Transplantation** :

2.6 **Congenital Pulmonary Anamolies** :

2.6.1 Abnormal Development of Lung Bud

2.6.2 Abnormalities of separation of the lung bud from the foregut

2.6.3 Abnormalities of Pulmonary Vasculature

2.6.4 Ectopic of Hamartomatous Development

2.7 **The Infant and Young Child :**

2.7.1 Pathologies of Diaphragm

2.7.2 Pleural Abnormalities

2.7.3 Inflammation

2.7.4 Airway Obstruction
2.7.5 Diffuse Lung Disease
2.7.6 Respiratory Distress in Newborn Baby

2.8 **Interventional Techniquies in Thoracs :**

2.8.1 Biopsy Procedures
2.8.2 Throacic Drainage Procedure
2.8.3 Thoracic Sympathectomy
2.8.4 Therapeutic Embolisation
2.8.5 Dilatation & Stenting Techniques
2.8.6 Extraction Techniques.

III. THE HEART AND GREAT VESSELS :

3.1 **Cardiac Anatomy and Enlargement** :
3.1.1 Plain Radiography
3.1.2 Enlargement of various chambers on Plain Radiography

3.2 **Echo Cardiography including Doppler** :

3.3 **Nuclear Cardiology** :

3.4 **Digital Imaging of Cardiovascular System** :

3.5 **Magnetic Resonance of Heart and Circulation** :

3.6 **Congenital Heart Disease** :
3.6.1 General Principles
3.6.2 Left to right shunts
3.6.3 Central Sinuses
3.6.4 Other Congenital Heart Disease

3.7 **Aquired Heart Disease :** i) Non Rheumatic/ Rheumatic Mitral VD
ii) Tricuspid VD
iii) Aortic VD

3.8 **Ischaemic Heart Disese :** i) Coronary Atreriography
ii) Left Ventriculography
iii) Angina Pectoris
iv) Myocardial Infarction
v) Mechanical Complication of MI

3.9 **Pumlonary Circulation :** i) Anatomy and Physiology
ii) Pulmonary Vascularity in Heart Disease
iii) Pulmonary Arterial hypertension/ Its Imaging
iv) MR in Pulmonary Vascular Abnormalities

3.10 **Cadiomyopathy , Cardio Tumors, Trauma :**

3.11 **The Imaging of Prosthetic Cardiac Valves :**

3.12 **The pericardium :**

3.13 **Thoracic Aorta :**

3.14 **Interventional Procedures and Heart Disease :**

IV. THE GASTROINTESTINAL TRACT:

- 4.1 **The Abdomen: Plain Radiographic findings In acute abdomen**
  - 4.1.1 Normal appearances
  - 4.1.2 Abdominal Calcification/Dilatation of bowel/Pneumoperitoneum
  - 4.1.3 The Post Operative Abdomen
  - 4.1.4 Inflammatory Conditions
- 4.2 **The Esophagus**
  - 4.2.1 Anatomy and Functions
  - 4.2.2 Methods of Examination
  - 4.2.3 Pathologies of Esophagus
  - 4.2.4 Motility Disorders
  - 4.2.5 Extrinsic lesions/miscellaneous conditions
- 4.3 **The stomach**
  - 4.3.1 Radiological anatomy and methods of examination
  - 4.3.2 Inflammatory Diseases
  - 4.3.3 Neoplastic Conditions
  - 4.4.4 Radionuclide Studies in Stomach
- 4.4 **The Duodenum**
  - 4.4.1 Anatomy and Normal Appearances
  - 4.4.2 Methods of Radiological Examination
  - 4.4.3 Peptic ulceration
  - 4.4.4 Gastro heterotopia/diverticula
  - 4.4.5 Neoplasms benign and malignant
- 4.5 **The Small Intestine**
  - 4.5.1 Anatomy and normal appearances
  - 4.5.2 Methods of radiological examination
  - 4.5.3 Crohns disease/Coeliac Disease/Neoplasms/various conditions
- 4.6 **The Large Bowel**
  - 4.6.1 Anatomy and Normal Appearances
  - 4.6.2 Methods of Radiological Examination
  - 4.6.3 Tumors
  - 4.6.4 Diverticular Disease
  - 4.6.5 Colitis
  - 4.6.6 Aids
  - 4.6.7 Miscellaneous Conditions
- 4.7 **Peritoneum, Mesentry and Omentum**
  - 4.7.1 Peritoneal spaces and reflections
  - 4.7.2 Abnormalities of Peritoneum
  - 4.7.3 Abnormalities of Mesentry
  - 4.7.4 Abnormalities of greater Omentum
- 4.8 **Gastrointestinal Angiography**
  - 4.8.1 General Consideration
  - 4.8.2 Gastro intestinal bleeding
- 4.9 **Interventional Radiology in Gastrointestinal tract**
  - 4.9.1 Introduction
  - 4.9.2 Esophagus
  - 4.9.3 Stomach and Duodenum
  - 4.9.4 Small Intestine
  - 4.9.5 Colon and Rectum

4.10 **Pediatric Gastrointestinal Radiology**
- 4.10.1 **The Neonate**
- 4.10.2 **The Infant and Older Child**

V. Liver, Biliary tract, Pancreas, Endocrine System and Lymphoma

5.1 **The Liver**
- 5.1.1 Normal and Variant Anatomy
- 5.1.2 Liver Imaging Techniques
- 5.1.3 Diffuse Disease
- 5.1.4 Focal Disease
- 5.1.5 Intervention

5.2 **The Biliary Tract**
- 5.2.1 Anatomic Consideration
- 5.2.2 Methods of Investigation
- 5.2.3 Biliary Disorders

5.3 **Interventional Techniques Hepatobiliary System**
- 5.3.1 Liver Biopsy
- 5.3.2 Biliary Obstruction
- 5.3.3 Malignant Biliary Obstruction
- 5.3.4 Percutaneous Cholangiography and Biliary Drainage Procedures
- 5.3.5 Vascular Interventional Techniques in Hepatobiliary System

5.4 **Radiology of Liver Transplantation**
- 5.4.1 Indications
- 5.4.2 Pre Transplant Assessment
- 5.4.3 Radiological Procedures before Transplantation
- 5.4.4 Post Transplantation Monitoring and Complications

5.5 **The Pancreas**
- 5.5.1 Embryology and Anatomy
- 5.5.2 Congenital Anomalies
- 5.5.3 Multisystem Diseases with Pancreatic involvement
- 5.5.4 Pancreatitis
- 5.5.5 Pancreatic Neoplasms
- 5.5.6 Trauma
- 5.5.7 Interventional Radiology in Pancreas

5.6 **Imaging of the Endocrine System :**
- 5.6.1 Hypothalamic – Pituitary Axis
- 5.6.2 Pineal Gland
- 5.6.3 Thyroid Gland
- 5.6.4 Parathyroid Gland
- 5.6.5 Pancreatic & Gastrointenstinal Endocrine Disorders
- 5.6.6 Carcinoid Tumors
- 5.6.7 Adrenal Glands
- 5.6.8 Female Reproductive System
- 5.6.9 Male Reproductive System

5.7 **Reticuloendothelial Disorders : Lymphoma**
- 5.7.1 Epidermilogy
- 5.7.2 Histopathological Classification
- 5.7.3 Staging Investigation and Management
- 5.7.4 Extranodal Manisfestation of Lymphoma
- 5.7.5 Monitoring response to therapy

5.8 **Reticuloendothenial Disorders : The Spleen**
- 5.8.1 Imaging Techniques
- 5.8.2 Normal Anatomy
- 5.8.3 Splenomegaly
- 5.8.4 Benign Mass Lesions
- 5.8.5 Malignant Mass Lesions
- 5.8.6 Splenic Trauma

5.9 **Paediatric Liver Billary Tract and Spleen :**
- 5.9.1 Techniques
- 5.9.2 Approach
- 5.9.3 Liver
- 5.9.4 Biliary Disease
- 5.9.5 Spleen

5.10 **Paediatirc Endocrine and Bone Density Imaging :**
- 5.10.1 Ultrasound
- 5.10.2 Nuclear Medicine
- 5.10.3 Magnetic Resonance Imaging
- 5.10.4 Bone Densitometry in Children

5.11 **Neuroblastoma :**

VI Genito Urinary Tract :

6.1 **Methods of Investigation :**

6.2 **Radionuclide Imaging in Genito Urinary Tract :**

6.3 **Urodynamics**

6.4 **Reno Vascular Disease :**
- 6.4.1 Renal Arteriography
- 6.4.2 Vascular Abnormalities
- 6.4.3 Radiological Management of Reno Vascular Disease

6.5 **Renal Parenchymal Disease**
- 6.5.1 Normal Appearance
- 6.5.2 Renal Parenchymal Disease
- 6.5.3 Parasitic Infections

6.6 **Renal Masses :**
- 6.6.1 Methods of Analysis
- 6.6.2 Pathological Renal Masses
- 6.6.3 Neoplastic Renal Masses

6.7 **Calculus Disease & Urothelial Lesions**
- 6.7.1 Calculus Disease
- 6.7.2 Nephrocalcinosis
- 6.7.3 Urothelial Tumors

6.8 **Urinary Obstruction :**
- 6.8.1 Pathophysiology
- 6.8.2 Causes of Obstruction

6.9 **Radiological Evaluation of Urinary Bladder, Prostrate & Urethra :**

6.10 **Injuries to the GenitoUrinary Tract :**

6.11 **Renal Failure and Transplantation :**

6.12 **Interventional Uroradiology :**

6.13 **Imaging of the Kidneys & Urinary Tract in Children**
- 6.13.1 Embryology
- 6.13.2 Techniques
- 6.13.3 Interventional Procedure

6.14 **Imaging of Paediatric Pelvis :**
- 6.14.1 Imaging Techniques
- 6.14.2 Normal Anatomy
- 6.14.3 Congenital Anomalies
- 6.14.4 Pelvis Masses
- 6.14.5 Scrotal Disease

VII Skeletal System :

7.1 **Skeletal Trauma**
7.2 **Bone Tumors : Generals Characteristic & Benign Lesions**
7.3 **Bone Tumors : Malignant Lesions**
7.4 **Myeloproliferative and Similar Disorders**
- 7.4.1 Generalised/Localised Decreased in Bone Density
- 7.4.2 Generalised/Localised Increased in Bone Density
- 7.4.3 Delayed Skeletal Matuarity

7.5 **Metabolic and Endocrine Disease of the Skeletal**
7.6 **Skeletal Dysplasias and Malformation Syndrome**
7.7 **Joints Diseases :**
- 7.7.1 Rhumatiod Arthritis
- 7.7.2 Other Connective Tissue Disease
- 7.7.3 Crystal Deposition Arthropathy
- 7.7.4 Degenerative Joint Disorders/Degenerative spine
- 7.7.5 Arthrography/ HPOA/ Pachy Dermoperiostritis

7.8 **Bone and Soft tissue Infection :**
7.9 **Imaging of Soft tissue :**
7.10 **Bone Tumors in Children :**
- 7.10.1 Imaging approach
- 7.10.2 Benign Bone Tumors
- 7.10.3 Malignant Bone Tumors

7.11 **The Radiology of Non Accidental Injry in Children :**
7.12 **Paediatric Musculo – Skeletal Trauma**
7.13 **Radiology of Arthritides in Children**
7.14 **Radiology of Soft tissue in Children**
7.15 **Bone and Soft tissue infection in Children**

VIII. The Reproductive System :

8.1 **Ultrasound in Obstetrics and Gynaecology**
- 8.1.1 Indication
- 8.1.2 Instrumentation in US Techniques
- 8.1.3 Gynaecological infertility
- 8.1.4 Assesing Tubal Patency

8.2 **Imaging in Gynaecology**
8.3 **Hysterosalpingography**
8.4 **The Breast & its Imaging**
8.5 **Breast Cancer**
8.6 **Male Reproductive System**

IX Central Nerve System :

9.1 **Skull and Brain : Methods of Examination and Anatomy**
9.2 **Cranial and Intracranial Pathology : Tumors in Adults**
9.3 **Cranial and Intracranial Pathology : Cerebro Vascular Disease and Non Traumatic Intracranial Haemorrhage**

9.4 **Cranial and Intracranial Pathology : Infections, AIDS, Demyelinating and Metabolic Disease**
9.5 **Cranial and Intracranial Pathology : Trauma, Bone Pathology, CSF Disturbances, Epilepsy**
9.6 **Spine : Method of Investigation**
9.7 **Imaging of Spinal Pathology**
9.8 **Scoliosis in Children**
9.9 **Neonatal Head and Spine Sonography**
9.10 **Neurology in Children**

X The Orbit ; ENT; Face; Teeth :

10.1. **The Orbit**
- 10.1.1 Anatomy / Techniques
- 10.1.2 Intraoccular Abnormalities
- 10.1.3 Lacrimal Gland Tumors
- 10.1.4 Muscular Tumors
- 10.1.5 Intra/Extra Canal Tumors

10.2. **Ear, Nose and Throat Radiology**
- 10.2.1 The Ear
- 10.2.2 Nose and Paranasal Sinuses
- 10.2.3 Phrynx

10.3. **Maxillofacial Radiology**
- 10.3.1 Fractures of Maxilla
- 10.3.2 TM Joint
- 10.3.3 Salivary Glands

10.4. **Dental Radiology**

10.5. **Paediatrics, Eye & Orbit :**
- 10.5.1 Imaging Techniques
- 10.5.2 Child with Proptosis or an Orbital mass
- 10.5.3 Child with Orbital Infection
- 10.5.4 Child with White Eye
- 10.5.5 Child with Development Abnormalities

10.6. **Paediatric ENT Imaging**

B. <u>RADIOLOGICAL PHYSICS & X-RAY TECHNOLOGY</u> :

1. **Radiation :**
2. **Production of X - Rays :**
3. **X- Ray Generators :**
4. **Basic Interaction between X- Rays and Matter :**
5. **Attenuation :**
6. **Filters :**
7. **X- Ray beam restrictors :**
8. **Physical characteristics of X- Ray films & film Processing :**
9. **Photographic characteristics of X- Ray films :**
10. **Fluroscopic imaging and Image Intensifier :**
11. **Viewing & recording of the Fluroscopic Image :**
12. **The Radiographic Image :**
13. **Geometry of the Radiographic Image :**
14. **Body section Radiography :**
15. **Stereoscopy :**

16. **Xero- Radiography :**
17. **Computed Tomography :**
18. **Ultrasound :**
19. **Digital Radiography :**
20. **Nuclear Magnetic Resonance :**
21. **Magnetic Resonance Imaging :**
22. **Radiation hazards & Protection :**
23. **Electric hazards & Protection :**
24. **Cine Angiography :**
25. **Atomic structure, Radioactive Isotopes & Gamma Camera :**
26. **Positron Emission Tomography :**
27. **Digital Subtraction Angiography :**
28. **Catheters, guides wires, dilators, balloons & stents :**
29. **Pictorial Achieving & Communicating System (PACS) :**
30. **DICOM :**

C. **DARK ROOM TECHNIQUES :**

1. **Layout of Ideal Dark Room : maintenance and its accessories :**
2. **Developer : ingredients & their action :**
3. **Developer : exhaustion & methods of determination :**
4. **Replenisher & rapid development :**
5. **Fixer : ingredients & their action :**
6. **Fixer : exhaustion & methods of determination :**
7. **Effect of temp on standard development /fixing time & methods to maintain it. :**
8. **Tropical processing :**
9. **Intensifying screens /construction, types and advantages :**
10. **Rare earth intensifying screens :**
11. **Intensification factor :**
12. **Cassette : construction & care**
13. **Factors affecting image details :**
14. **Factors affecting image contrast & density :**
15. **Grids : construction & types**
16. **Cones & collimeter :**
17. **X Ray films - construction, types & storage :**
18. **Film faults in dark room & their prevention :**
19. **Film fog :**
20. **Hangers :**
21. **Safe light :**
22. **Automatic developing unit :**
23. **Day light loading and unloading of films :**

Examination for the post graduate diploma in medical radio diagnosis.

Paper – I

Basic sciences related to Radiology
(Anatomy, Pathology, Basic and Radiation Physics, Technique and Dark Room processing and apparatus Construction).

Time: 3 Hrs Maximum 100 marks.

Answer all the questions.

Write briefly on: (10 X 10 = 100 Marks)

1. Gamma camera.
2. Multidetector CT
3. Image intensifier.
4. Protective measures in diagnostic department.
5. Biological effects of radiation.
6. Developmental anomalies of kidneys
7. Bronchopulmonary segments
8. Imaging anatomy of Sella and Parasellar region
9. Pathology of Tumors of mediastinum
10. Pathological classification of bone tumours

Examination for the post graduate diploma in medical radio diagnosis.

Paper – II

(Central nervous system including Head and Neck, Musculoskeletal, Chest, Mammography, Cardiovascular system).

Time: 3 Hrs Maximum 100 marks.

Answer all the questions.

1. Describe in detail imaging features of bronchogenic carcinoma. (25 marks)

2. Classify congenital heart diseases and Briefly mention about (25 marks) Imaging features of cyanotic heart diseases.

3. Write short notes on : (10 X 5 = 50 marks)

   a. Aneurysmal bone cyst

   b. Thymoma

   c. Mucopolysaccharidoses

   d. Intramedullary mass lesions

   e. Meningioma

Examination for the post graduate diploma in medical radio diagnosis.

Paper – III

(Abdominal, Imaging including Gastro intestinal, Genito urinary, Hepatobiliary, Interventional radiology, obst and Gynae).

Time: 3 Hrs Maximum 100 marks.

Answer all the questions.

4. Describe in detail imaging features of tumors of the stomach. (25 marks)

5. Describe in detail imaging features of renal hypertension. (25 marks)

6. Write short notes on: (10 X 5 =50 Marks).

    a. Renal angiography
    b. Hepatoma
    c. Ulcerative colitis
    d. Intrauterine growth retardation
    e. Polycystic ovaries