

**P.G. Curriculum
Diploma in Med. Radio Diagnosis (DMRD)
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PG Curriculum Diploma in Med. Radio Diagnosis (DMRD)

The infrastructure and faculty of the department of Radio-diagnosis will be as per MCI guidelines.

1. Goals

The two year course in Radiodiagnosis is aimed at imparting training in both conventional radiology and modern imaging techniques so that the candidate is fully competent to practice, teach and do research in the broad discipline of radiology including ultrasound, Computed Tomography and Magnetic Resonance Imaging.

Candidate should be well versed with medical ethics and consumer protection act and the Prenatal Diagnostic Technique (PNDT) Act.

2. Objectives

A resident on completing his/her DMRD (Radio-diagnosis) should have acquired good basic knowledge in the various sub-specialties of radiology such as Neuro-radiology, GI-radiology, Uro-radiology, Vascular- radiology, Musculoskeletal, Interventional radiology, Emergency radiology, Pediatric radiology and Mammography, and be able to

- ❖ Independently conduct and interpret all routine and special radiological and imaging investigations.
- ❖ Provide radiological services in acute emergency and trauma including its medico legal aspects.
- ❖ Elicit indications, diagnostic features and limitation of application of ultrasonography, CT and MRI and should be able to describe proper cost-effective algorithm of various imaging techniques in a given problem setting.
Perform (under supervision) basic image guided interventional procedures for diagnosis and therapeutic management.
- ❖ Formulate basic research protocols and carry out research in the field of radiology related clinical problems.
- ❖ Undertake further specialization in any of the above mentioned branches in Radio-diagnosis such as Gastrointestinal radiology, Uro- radiology, Neuro- radiology, Vascular radiology, Musculoskeletal radiology, Interventional radiology etc.
- ❖ To interact with other specialists and super-specialists so that maximum benefit to the patient accrues.
- ❖ Work as a Senior Resident/consultant in Radiodiagnosis and conduct the teaching programme for undergraduates, postgraduates as well as paramedical and technical personnel.
- ❖ Organize CME in the speciality utilizing modern methods of teaching and evaluation.

3. Syllabus

3.1 Theory

❖ **Basic science related to the speciality of Radio-diagnosis**

- Radiation Physics and Radiation Biology
 - ★ Introduction to general properties of radiation
 - ★ Production of X-Ray
 - ★ Characteristic properties of X-Ray
 - ★ Interaction of X-Rays with matter and their effects
 - ★ Units of radiation, radiation measurement
 - ★ Image receptors . X-Ray film, intensifying screen
 - ★ Formation of radiographic image
 - ★ X-Ray equipments .Conventional X-Ray Units, Fluoroscopy units (conventional, image intensifier), Advanced imaging equipments. US, CT, MRI, Angiography, cine fluoroscopy and cine angiography
 - ★ Film procession dark room equipments and procedures-manual, automatic,
 - ★ Day light processing
- Quality assurance
- Radiation hazards and radiation protection
- Contrast media . types, chemical composition, mechanism of action, dose schedule, route of administration, adverse reaction and their management.
- Nuclear Medicine. Diagnostic use of important isotopes in different organ systems.
- Instruments/equipment in Nuclear Medicine and their recent advances.
- Picture archiving and communication system (PACS) and Radiology information system (RIS) to make a film less department.

❖ **Respiratory System**

Disease of the chest wall, diaphragm, pleura and airway; pulmonary vasculature; pulmonary; infections; pulmonary neoplasm; diffuse lung disease; mediastinal disease; chest trauma; post-operative and intensive care imaging.

❖ **Gastrointestinal (GIT) and Hepato-Biliary-Pancreatic System**

Diseases and disorders of mouth, pharynx, salivary glands, esophagus, stomach, small intestine, large intestine, diseases of omentum, peritoneum and mesentery, acute abdomen, abdominal trauma. Diseases and disorders of hepato-biliary-pancreatic system. Conventional and other imaging methods like US, CT, MRI, DSA and isotope studies pertaining to these systems.

❖ **Genito-Urinary System**

Various diseases and disorders of genito-urinary system. These include: congenital inflammatory, traumatic, neoplastic, calculus disease and miscellaneous conditions. He/she should also be able to perform and interpret conventional and other diagnostic imaging procedures used to evaluate urinary tract pathology i.e., ultrasound, CT, MRI, angiography. He/She should be able to perform vascular/non-vascular interventions of genito-urinary system.

❖ **Musculoskeletal System**

Imaging (Conventional, Ultrasound, CT, MRI, angiography, Radio-isotope studies) and interpretation of disease of muscles, soft tissue, bones and joints including congenital inflammatory, traumatic, metabolic and endocrine, neoplastic and miscellaneous conditions.

❖ **Cardiovascular Radiology**

Diseases and disorder of cardiovascular system (congenital and acquired conditions) and the role of imaging by conventional radiology, ultrasound, Color-Doppler, CT, MRI, angiography radio nuclide studies.

❖ **Neuro-Radiology**

Includes imaging (using conventional and newer methods) and interpretation of various diseases and disorders of the head, and spine covering congenital, infective, vascular, traumatic and neoplastic conditions. This will also include disease of the eye and ENT.

❖ **Radiology Emergency Medicine**

The student should be able to evaluate emergency radiographic examinations with reasonable accuracy and have clear understanding of the protocol of imaging in emergency situations of different organ systems.

❖ **Mammography and Breast Intervention**

Role of screen film mammography (conventional and digital) in screening of breast cancer, benign and malignant lesions of the breast.

❖ **General Radiology**

➤ **Conventional Radiology**

The student should be able to evaluate conventional radiographs including radiographs on chest abdomen, pelvis, skull (including PNS + Orbit), spine, musculoskeletal and soft tissues. Student should be able to perform radiography of different body parts.

➤ **Ultrasound**

The student should be able to perform and interpret all ultrasound studies. These studies include: abdomen, pelvis, small parts, neonatal head, breast, color-duplex imaging (arterial and venous studies), obstetric/gynecology and intervention procedures using ultrasound guidance.

➤ **CT**

- ★ Select CT protocol according to the clinical diagnosis.
- ★ Demonstrate knowledge of the CT finding of the common pathological conditions.
- ★ Interpret conventional and modified body CT examinations.
- ★ Know limitations of CT in the diagnosis of certain diseases.
- ★ Perform CT guided simple interventions (under supervision)

➤ **Angiography**

The student should be able to interpret and preferably perform (under supervision) routine angiographic procedures and vascular interventions.

➤ **MRI**

- ★ Select MRI protocol according to the clinical diagnosis
- ★ Knowledge of conventional and modified MRI examinations, including MRA, MRV, MRCP, MRS.
- ★ Demonstrate knowledge of the MRI of the common pathological conditions.

➤ **Interventional Radiology**

The student should be able to perform (under supervision) simple interventional procedures of all the organ systems.

3.2 Practical

❖ **Practical Schedule –Physics**

- Film characteristics
- Effectiveness of Lead Apron and other protective Devices
- Beam parameters check
- Optical Radiation field alignment
- Assessment of Scatter radiation
- Quality control of X-rays and Imaging equipments
- Evaluation of performance of a film processing unit

❖ **Practical radiography**

- Dark room techniques
- Radiography of the extremities
- Radiography of the spine, abdomen, pelvic girdle and thorax
- Radiography of the skull
- Contrast techniques and interpretation of GI tract, biliary tract, etc.
- Contrast techniques and interpretation of the Genito-urinary system
- Contrast techniques and interpretation of the central nervous and Cardiovascular system
- Miniature radiography, Macro-radiography and magnification techniques
- Dental and portable radiography

❖ **Anatomy**

Gross and cross sectional Anatomy of all the body systems

❖ **Pathology**

Gross morphology of pathological condition of various systems

❖ **Contrast Media**

Their types, formulations, mechanism of action, dose schedule, routes of administration, adverse reactions and their management.

4. Teaching Programme

4.1 General Principles

Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training is skill oriented.

Learning in postgraduate program is essentially self directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

4.2 Teaching Sessions

In addition to conducting and reporting of routine and special investigation in the area of posting under direct supervision, formal teaching session to be held on working days. These include seminars in physics and general radiology, journal clubs, case presentations; Interdepartmental meets, Film reading session.

4.3 Teaching Schedule

The suggested departmental teaching schedule is as follows:

1. Seminar	Once a week
2. Film Reading	Once a week
3. Case presentation	Once a week
4. Inter department meet	Once a week
5. Journal club	Once a week
6. Film Reading / Physics Seminar	Once a week

Note:

- ❖ All sessions will be co-ordinated by the faculty members.
- ❖ All the teaching sessions to be assessed by the consultants at the end of session and graded
- ❖ Attendance of the Residents at various sessions should be atleast 75%

5. Posting

The postgraduate student should be posted in all sections (Conventional radiology, U/S, CT, MRI etc.) so that there is adequate exposure to all modalities.

The proposed duration of postings is as under.

-Conventional Radiology 12 months

-Sonography	6 months
-CT / MRI	4 months

SCHEDULE FOR ROTATION OF RESIDENTS

1 st Year (PG 1/6)	Musculo Skeletal	Emergency	US	US	Chest	Chest
	G.U	G.U	G.I.T	G.I.T	CT	CT
(PG 2/6)						
2 nd Year (PG3/6)	US	US	Chest	Musculo Skeletal	Emergency	Emergency
	CT	CT	Intervention U/S / CT	US	MRI	MRI
(PG 4/6)						

6. Assessment

All the PG resident are assessed daily for their academic activities and also periodically.

6.1 General Principles

- ❖ The assessment is valid, objective and reliable
- ❖ Formative, continuing and summative (final) assessment is conducted in theory as well as practical / clinicals. In addition, thesis is assessed separately.

6.2 Formative Assessment

The formative assessment is continuous as well as end-of-term. The former is based on the feedback from the senior residents and the consultants concerned. End-of-term assessment is held at the end of each semester (upto the 5th semester). Formative assessment will not count towards pass/fail at the end of the program, but will provide feedback to the candidate.

6.3 Internal Assessment

The performance of the Postgraduate student during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student. Marks should be allotted out of 100 as followed.

Sr. No.	Items	Marks
1.	Personal Attributes	20

2.	<i>Clinical Work</i>	20
3.	<i>Academic activities</i>	20
4.	<i>End of term theory examination</i>	20
5.	<i>End of term practical examination</i>	20

1. Personal attributes

- ❖ **Behavior and Emotional Stability:** Dependable, disciplined, dedicated, stable in emergency situation shows positive approach.
- ❖ **Motivation and Initiative:** Takes on responsibility, innovative enterprising, does not shirk duties or leave any work pending.
- ❖ **Honesty and Integrity:** Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.
- ❖ **Interpersonal Skills and Leadership Quality:** Has compassionate attitude towards patients and attendants, gets on well with colleagues and paramedical staff, is respectful to seniors, has good communication skills.

2. Clinical Work:

- ❖ **Availability:** Punctual, available continuously on duty, responds promptly on calls and take proper permission for leave.
- ❖ **Diligence:** Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.
- ❖ **Academic ability:** Intelligent, shows sound knowledge and skills, participates adequately in academic activities, and performs well in oral presentation and departmental tests.
- ❖ **Clinical Performance:** Proficient in clinical presentations and case discussion during rounds and OPD work up.
Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management)
Skill of performing bed side procedures and handling emergencies.

- 3. Academic Activity:** Performance during presentation at Journal club/Seminar/Case discussion/Stat meeting and other academic sessions.
Proficiency in skills as mentioned in job responsibilities.

- 4. End of term theory examination:** Written test conducted at end of 1st year and 9 months

- 5. End of term practical/oral examination:** Practical exam and viva examination at end of 1 year and 9 months

Marks for **personal attributes** and **clinical work** should be given annually by all the consultants under whom the resident was posted during the year. Average of the Two years should be put as the final marks out of 20.

Marks for **academic activity** should be given by the all consultants who have attended the session presented by the student.

The Internal assessment should be presented to the Board of examiners for due consideration at the time of Final Examination

6.4 Summative Assessment

Ratio of marks in theory and practical will be equal

The pass percentage will be 50%

Candidate will have to pass theory and practical examination separately

A. Theory

	Title	Marks
Paper I	Basic sciences related to radiology (it consist of Anatomy, Pathology, Basic & Radiation Physics Technique & Dark room processing & apparatus construction)	100
Paper II	Physics as applied to Medical Radiology	100
Paper III	Diagnostic Radiology and recent advances	100
Total		400

B. Practical

1.	Long Case (1)	100
2.	Short Cases(2) 50 marks each	100
3.	Viva Voce	100
Total		300

7. Job Responsibilities

- ❖ To work up of all cases coming for special investigations (Barium studies, Urological investigation, U/S, CT and MR) To confirm that proper preparation of the patient has been done.
- ❖ To perform various radiological procedures keeping in view the following:
 - Low radiation Dose to the patient and doctor
 - Patient comfort
 - Diagnostic yield

- ❖ To observe the findings and discuss the interpretations with the consultants and document them.
- ❖ To assist the consultants in various guided procedures carried out in the department like
 - -Aspirations
 - -PCN
 - -Catheter Insertion
 - -PTBD
- ❖ To take clinical classes of undergraduates students.

8. Suggested Books

8.1 Books

- ❖ Sutton: Text book of Radiology and Imaging volume-I-II.
- ❖ Grainger and Allison's Diagnostic Radiology: Text book of Medical Imaging
- ❖ Haaga J.R.: Computed Tomography and MRI volume-I and II.
- ❖ Rumack: Diagnostic ultrasound volume I & II
- ❖ Lee: Computed body tomography with MRI volume-I & II
- ❖ Osborn A.G.: Diagnostic neuro-radiology
- ❖ Jacobson's: Radiology of skeletal disorders
- ❖ Gore Levine: Text book of Gastrointestinal Radiology
- ❖ Margulis: Alimentary tract radiology volume I & II
- ❖ Davidson's: Radiology of the kidney and Genito-urinary tract
- ❖ Clark: Positioning in radiology
- ❖ Dahnert: Radiology Review Manual
- ❖ Webb: High Resolution CT of the lung
- ❖ Som and Curtin: Head and neck imaging
- ❖ Stark and Bradley: Magnetic resonance imaging Volume I & II
- ❖ Scott W. Atlas: MR imaging of the brain and spine
- ❖ Mittelstaedt CA : General ultrasound
- ❖ Callen: Ultrasonography in obstetrics and gynaecology

8.2 Journals

- ❖ Indian Journal of Radiology
- ❖ Radiology
- ❖ Radiologic clinics of North America
- ❖ Seminars in U/S, CT and MRI
- ❖ pAmerican Journal of Neuro-Radiology

9. Model Test Papers

MODEL QUESTION PAPER
Diploma in Med. Radio Diagnosis (DMRD)
Paper-I
Basic Science related to Radiology

Max. Marks:100

Time: 3 hrs

- **Attempt ALL questions**
 - **Answer each question & its parts in SEQUENTIAL ORDER**
 - **ALL questions carry equal marks**
 - **Illustrate your answer with SUITABLE DIAGRAMS**
-

1. Discuss various type of the iodinated contrast media and their adverse reactions.
2. What is structure of intensifying screen and discuss the different types of intensifying screens.
3. Discuss briefly the principle of multi-detector CT.
4. What are grids? Discuss the characteristics of and types of Grids.
5. What is rectification? Give diagrammatic representation of 3 phase circuit.
6. What is Doppler principle? Discuss its various clinical applications.
7. What is PACS? Discuss its application in modern hospital.
8. Give diagrammatic representing of X-Ray tube with rotating anode.
9. Describe briefly Thermo-luminescent dosimeters (TLD).
10. Discuss various types of magnets and gradient coils in MR.

MODEL QUESTION PAPER
Diploma in Med. Radio Diagnosis (DMRD)
Paper-II
Physics as applied to Medical Radiology

Max. Marks:100

Time: 3 hrs

- **Attempt ALL questions**
 - **Answer each question & its parts in SEQUENTIAL ORDER**
 - **ALL questions carry equal marks**
 - **Illustrate your answer with SUITABLE DIAGRAMS**
-

1. Give differential diagnosis of mediastinal masses according to their anatomical location.
2. Discuss the various chest infection in a HIV +ve patient.
3. Discuss the X-ray features of Acynotic congenital heart disease.
4. Discuss the technique of double contrast barium study of stomach and duodenum.
5. Describe the radiological features of gastrointestinal tuberculosis.
6. Enumerate the causes of ulcerative lesions of large gut and describe their radiologic features.
7. Describe the indications and advantages of MRCP over ERCP.
8. Discuss radiological features of seronegative arthropathios.
9. Discuss the radiology of various cartilaginous tumors.
10. Describe the pathology and radiologic features of posterior fossa tumours.

MODEL QUESTION PAPER
Diploma in Med. Radio Diagnosis (DMRD)
Paper-III
Radio-diagnosis as related to Pathology

Max. Marks:100

Time: 3 hrs

- **Attempt ALL questions**
 - **Answer each question & its parts in SEQUENTIAL ORDER**
 - **ALL questions carry equal marks**
 - **Illustrate your answer with SUITABLE DIAGRAMS**
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1. Discuss the role of sonomammography in evaluation of breast lesions.
2. Radio-frequency ablation of renal tumors and its indication technique and advantages.
3. Discuss briefly CT perfusion.
4. Discuss role of CT angiography in coronary artery disease.
5. Discuss applications of PET CT.
6. Radiological investigations in renal artery stenosis.
7. How will you investigate radiology a 3 year old child presenting with lump in right hypocondrium.
8. How will you investigate a 45 year old male presenting with upper GI bleed.
9. Discuss ultrasound and Doppler findings in IUGR.
10. Enumerate the radiological investigations for female patient of primary infertility.