

**P.G. Curriculum
MD Radio-diagnosis
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Curriculum M.D. Radio-diagnosis

The infrastructure and faculty of the department of Radio-diagnosis will be as per MCE Guidelines.

1. Goals

The three 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 MD (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 10 to 14 months

-U/S 10 to 12 months

-CT / MRI 10 to 12months

SCHEDULE FOR ROTATION OF RESIDENTS

1st Year (PG 1/6)	Musculo Emergency Skeletal		US	US	Chest	Chest
	G.UG.U		G.I.T	G.I.T	CT	CT
(PG 2/6)						
2nd Year (PG3/6)	US	US	Chest	Musculo Skeletal	Emergency	Emergency
	CT	CT	Intervention U/S / CT	US	MRI	MRI
(PG 4/6)						
3rd Year (PG 5/6)	G.I.T	G.I.T	US	US / CT Intervention	CT	CT
(PG 6/6)	MRI	MRI	US	Chest	Elective	Elective

6. Thesis

The student should be able to demonstrate capability in research by planning and conducting systematic scientific research and data analysis and deriving conclusion.

Every candidate shall carry out work on an assigned research project under the guidance of a recognized Postgraduate Teacher, the project shall be written and submitted in the form of a Thesis

Every candidate shall submit thesis plan to the university within the time frame mentioned by the university.

Thesis shall be submitted to the University six months before the commencement of theory examination i.e for examination May/June session, 30th November of the proceeding year of examination and for November / December session 31st May of the year of examination.

The student will identify (i) a relevant research question; (ii) conduct a critical review of literature; (iii) formulate a hypothesis; (iv) determine the most suitable study design; (v) state the objectives of the study; (vi) prepare a study protocol; (vii) undertake a study according to the protocol; (viii) analyze and interpret research data and draw conclusion; (ix) write a research paper.

7. Assessment

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

7.1 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.

7.2 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.

7.3 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. Clinical Work 20
3. Academic activities 20
4. End of term theory examination 20
5. End of term practical examination 20

1. Personal attributes:

Behavior and Emotional Stability: Dependable, disciplined, dedicated, stable in emergency situations, 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:

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Availability: Punctual, available continuously on duty, responds promptly on calls and takes 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 conducted at end of 1st, 2nd year and after 2 years 9 months

5. End of term practical/oral examinations after 2 years 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 three 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 resident.

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

7.4 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 Examination (Total=400)

Paper	Title	Marks
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Paper I	Basic sciences related to radiology	100
Paper II	Principles and practice of Radio-diagnosis	100
Paper III	Radio-diagnosis as related to pathology	100
Paper IV	Recent advances & radiology as applied to other specialties.	100

B. Practical Examination and Viva voce (Total=400)

1.	One long case	100
2.	Two short cases	100
3.	Imaging spots (50 spots)	100
4.	Radiation physics VIVA	50
5.	Practical Radiography /USG demonstration	50

8. 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.

9. Suggested Books

9.1 Core 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

9.2 Reference books:-

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

9.3 Journals:-

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

10. Model Test Papers

MODEL QUESTION PAPER

MD (Radiology)
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
-

- I Discuss factors affecting the contrast of an X-ray image.
- II What is the structure of intensifying screen? What are its types? Tabulate the differences between them.
- III Give the diagrammatic representation of Rotatory anode X-ray tube. Describe the line focus principle.
- IV What are the factors that can contribute to reduction of radiation dose to the patient & the operator?
- V Discuss the various types of magnets & gradient coils used in MRI.
- VI Give a comparison of different modalities available for Angiography in diagnostic radiology & imaging.
- VII Discuss contrast media used in MRI, their indications & side effects.
- VIII Discuss the normal pattern of white matter myelination on MR imaging.
- IX Write a note on 3D Ultrasound & its clinical application.
- X Describe briefly the types of detectors used in Multidetector CT.

MODEL QUESTION PAPER

MD (Radiology)

Paper-II

Principles & Practice of Radio-diagnosis

Max. Marks:100Time: 3 hrs

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

- I Differential diagnosis of hyperdense posterior fossa mass in child.
- II Enumerate the causes of hydrocephalous & discuss the radiological features.
- III Describe the various imaging features of Diastometomyelia
- IV Enumerate the various Neurocutaneous syndromes & describe the radiological features of any one of them.
- V What are the Radiological findings of collagen vascular disorders on Chest X-ray?
- VI What is the pathogenesis of lung sequestration. Discuss its Radiological features?
- VII Describe the imaging features of various Cerebello-pontine angle tumors
- VIII What are the differential diagnosis of metaphyseal lytic lesion in a 12 year old child?
- IX What are the imaging features of Pseudo tumor of the orbit? Discuss its differential diagnosis?
- X Enumerate the causes of Acroosteolysis.

MODEL QUESTION PAPER

MD (Radiology)

Paper-III

Radio-diagnosis as related to Pathology

Max. Marks:100Time: 3 hrs

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

- I Classify the types of tracheo-oesophageal fistula with their radiological features.
- II Discuss the appearance of Hydatid cyst in liver on ultrasound.
- III Describe the technique of Percutaneous nephrostomy and its indications.
- IV Describe the imaging features of Carcinoid tumour of the gut.
- V What are the Radiological features of Lymphoma of gut?
- VI Enumerate the cause of Portal hypertension and describe the ultrasound Doppler findings.
- VII What is the role of Transrectal U/S in the assessment of prostatic carcinoma
- VIII Discuss the role of CT in staging of pancreatic tumour.
- IX What are the imaging findings of pelvic endometriosis?
- X Enumerate the causes of Hydrops foetalis? Give the imaging findings.

MODEL QUESTION PAPER

MD (Radiology)
Paper-IV

Recent advances and Radiology as applied to other specialties

Max. Marks:100Time: 3 hrs

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

- I Write a brief note on the indications and advantages of MRCP over ERCP
- II Describe the technique of Double contrast evaluation of stomach & duodenum and give its advantages over a single contrast evaluation.
- III What is the role of diffusion & perfusion weighted imaging in acute stroke?
- IV Discuss the Indications & advantages of coronary CT angiography over DSA.
- V What are the radiological features of carcinoma colon and discuss the technique advantages, pitfalls & contra indications of CT colonoscopy.
- VI Radio frequency ablation of hepatic tumor –its indications, technique & advantages.
- VII How will you evaluate a patient with upper GI bleed?
- VIII How will you Evaluate a sixty year old patient suspected to have an aortic Aneurysm?
- IX What is the etiology of acute rejection & discuss the role of U/S Doppler in the diagnosis of acute rejection after renal transplant.
- X What is the role of Sono-mammography in evaluation of breast lesion?