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# MGM INSTITUTE OF HEALTH SCIENCES

(Deemed University u/s 3 of UGC Act, 1956)

Grade 'A' Accredited by NAAC

## PhD CET Syllabus

### Paper II - Subject Specific Test Radiology

#### MGM 14 MD Radiodiagnosis

##### **Program Outcomes**

The objective of the program is to train a student to become a skilled and competent radiologist to conduct and interpret various diagnostic/interventional imaging studies (both conventional and advanced imaging), to organize and conduct research and teaching activities and be well versed with medical ethics and legal aspects of imaging/intervention.

##### **Cognitive based**

The student should be able to:

- PO1. Understand basics of X-ray production, its uses and hazards.
- PO2. Appreciate and diagnose changes in bones -like fractures, infections, tumours and metabolic bone diseases.
- PO3. Identify and diagnose various radiological changes in disease conditions of chest and mediastinum, skeletal system, G.I. Tract, Hepatobiliary system and G.U. system.
- PO4. Learn about various imaging techniques, including isotopes C.T., Ultrasound, M.R.I. and D.S.A.

##### **Skills**

At the end of the course the student should be able to:

- PO5. Use basic protective techniques during various imaging procedures.
- PO6. Interpret common X-ray, radio-diagnostic techniques in various community situations.
- PO7. Advise appropriate diagnostic procedures in specialized circumstances to appropriate specialists.

#### ***SUBJECT SPECIFIC COMPETENCIES***

##### **A. Cognitive Domain**

A post graduate student on completing MD (Radiodiagnosis) should acquire knowledge in the following areas, and be able to:

1. Acquire good basic knowledge in the various sub-specialties of radiology such as chest radiology, neuro-radiology, GI-radiology, uro-radiology, cardio-vascular-radiology, musculoskeletal, interventional radiology, emergency radiology, pediatric radiology and women's imaging.

2. Independently conduct and interpret all routine and special radiologic and imaging investigations.
3. provide radiological services in acute emergency and trauma including its medico-legal aspects.
4. Elicit indications, diagnostic features and limitation of applications of ultrasonography, CT and MRI and should be able to describe proper cost-effective algorithm of various imaging techniques in a given problem setting.
5. Decide on the various image-guided interventional procedures to be done for diagnosis and therapeutic management.
6. Able to decide on further specialization to be undertaken in any of the branches in Radiodiagnosis such as gastrointestinal radiology, uro-radiology, neuro-radiology, vascular radiology, musculoskeletal radiology, interventional radiology etc.
7. Able to formulate basic research protocols and carry out research in the field of radiology- related clinical problems.
8. Acquire knowledge and teaching capabilities to work as a post graduate student /consultant in Radiodiagnosis and conduct teaching programmes for undergraduates, post graduates as well as paramedical and technical personnel.
9. interact with other specialists and super-specialists so that maximum benefit accrues to the patient.
10. Should be able to organize CME activities in the specialty utilizing modern methods of teaching and evaluation.
11. Acquire knowledge to impart training in both conventional radiology and modern imaging techniques so that the post graduate student is fully competent to practice, teach and do research in the broad discipline of radiology including ultrasound, Computed Tomography and Magnetic Resonance Imaging.
12. Acquire knowledge of interventional radiology.

#### **B. Affective Domain:**

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

#### **C. Psychomotor domain**

Practical Training will include two major aspects:

- A) Interpretation of images, and
- B) Skill in performing a procedure.

**A) Interpretation of images:**

**The student should be able to interpret images on all imaging modalities of diseases of following organs :**

1. **Musculo-skeletal System** - Interpretation of diseases of muscles, soft tissue, bones and joints including congenital, inflammatory, traumatic, endocrine and metabolic, neoplastic and miscellaneous conditions.
2. **Respiratory System** - Interpretation of diseases of the chest wall, diaphragm, pleura and airway; pulmonary infections, pulmonary vasculature; pulmonary neoplasm; diffuse lung disease; mediastinal disease, chest trauma; post-operative lung and X-ray in intensive care.
3. **Cardiovascular System** - Interpretation of diseases and disorders of cardiovascular system (congenital and acquired conditions) and the role of imaging by conventional radiology, ultrasound, colour Doppler, CT, MRI, Angiography and Isotopes Studies.
4. **Gastro-intestinal tract and hepato-biliary pancreatic system** - Interpretation of 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 liver, biliary system and pancreas.
5. **Urogenital System** - Interpretation of various diseases and disorders of genitor-urinary system. These include: congenital, inflammatory, traumatic, neoplastic, calculus disease and miscellaneous conditions.
6. **Central Nervous System (C.N.S.)** - Interpretation of diseases and disorders of the head, neck and spine covering, congenital, infective, vascular, traumatic neoplastic degeneration metabolic and miscellaneous condition.
7. Imaging in Emergency Medicine.
8. Imaging in Obstetrics and Gynecology.
9. Imaging of Breast and interventional procedures.
11. ENT, EYE and Dental Imaging.
11. Imaging of endocrine glands and those involved with metabolic diseases.
12. Clinical applied radionuclide imaging.
13. Interventional Radiology

**B) Skills in performing a procedure**

**The student should be able to perform the following procedures:**

- 1) **GIT contrast studies:** Barium studies (swallow, upper GI, Follow through, enema);

- fistulogram; sialogram; cologram/ileostogram,
- 2) **GU:** Excretory urography, MCU, RGU, nephrostogram, genitogram,
  - 3) **Ultrasound:** Studies of whole body including neonatal transfontanel studies, Doppler studies,
  - 4) **CT scan:** should be able to position a patient, plan study as per the clinical indication, do reconstruction of images, perform triple phase study, perform & interpret advanced applications like CT enterography, CT angiography etc.
  - 5) **MRI:** plan and perform MRI studies of whole body
  - 6) **DSA:** should be able to describe the techniques, do (if available to student) transfemoral puncture and insert catheter, help in angiographic procedures both diagnostic and interventional.
  - 7) **Radiography:** should be able to independently do radiography of common and some important uncommon views of different body parts. This includes positioning, centering of X ray beam, setting of exposure parameters, exposing and developing the films. The student should be familiar with not only conventional radiography but with CR and DR systems.
  - 8) **Interventional radiology:** The student should be able to perform simple, common non-vascular procedures under ultrasound and fluoroscopy guidance e.g. abscess drainage, drainage catheter placement, nephrostomy, biliary drainage etc. The student should have knowledge of common vascular interventions e.g stricture dilatation using balloon catheters, embolization with gel foam and other agents, names of common catheters, handling of intravenous contrast reactions; techniques, indications and contraindications for various procedures;

## COURSES OUTCOME

### *Syllabus*

#### **Course contents:**

##### **Anatomy**

Gross and cross sectional anatomy of all the body systems.

##### **Pathology**

Gross morphology of pathological conditions of systemic diseases affecting all organ systems.

##### **Radiology Course**

This would cover imaging and interventions of diseases affecting all the body systems:

- Chest
- Cardiovascular system
- Musculoskeletal including soft tissue
- Gastrointestinal system
- Hepato-biliary-pancreatic system
- Urogenital (genito-urinary) system

- CNS including head and neck
- Obstetrics and gynaecology
- ENT, eye, dental, breast
- Endocrine and metabolic system
- Clinically applied radionuclide imaging

### **Radiological Physics**

1. Introduction of general properties of radiation and matter: Fundamentals of nuclear physics and radioactivity
2. Interaction of x-rays and gamma rays with matter and their effects on irradiated materials
3. X-ray Generating Apparatus
4. Screen-film radiography
5. Film processing: Dark room, dry processing, laser /dry chemistry cameras, artifacts.
6. Fluoroscopy: Digital including flat panel units, fluoroscopy cum radiography units
7. Digital radiography: Computed Radiography, Flat panel radiography
8. Other equipments: Ultrasound including Doppler, CT, MRI and DSA
9. Contrast Media (Iodinated, MR & Ultrasound) - types, chemical composition, mechanism of action, dose schedule, route of administration, adverse reaction and their management
10. Nuclear Medicine: Equipments and isotopes in various organ systems and recent advances
11. Picture Archiving and Communication System (PACS) and Radiology Information System (RIS) to make a film-less department and for Teleradiology
12. Radiation protection, dosimetry and radiation biology
13. Image quality and Quality Assurance (QA)
14. Recent advances in radiology and imaging

The student should have knowledge of the following physics experiments:

- Check accuracy of kVp and timer of an X ray unit
- Check accuracy of congruence of optical radiation field
- Check perpendicularity of x ray beam
- Determine focal spot size
- Check linearity of timer of x ray unit
- Check linearity of mA
- Verification of inverse square law for radiation
- Check film screen contact
- Check film screen resolution
- Determine total filtration of an x ray unit
- Processor quality assurance test

- Radiological protection survey of an x ray unit
- Check compatibility of safe light
- Check performance of view box
- Effect of kVp on x ray output

### **Radiography and processing techniques**

1. Processing techniques: includes dark room and dry processing.
2. Radiography of the musculo-skeletal system including extremities.
3. Radiography of the chest, spine, abdomen and pelvic girdle.
4. Radiography of the skull, orbit, sinuses.
5. Contrast techniques and interpretation of GI tract, hepato-biliary tract, pancreas etc.
6. Contrast techniques and interpretation of the Central Nervous system.
7. Contrast techniques and interpretation of the cardiovascular system including chest.
8. Contrast techniques and interpretation of the genito - urinary system including Obstetrics and Gynaecology.
9. Paediatric radiology including MCU, genitogram, bone age.
10. Dental, portable and emergency (casualty) radiography.



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