

# **Program and Course Structure**

**School of Medical Science and Research**

**MD (Radiodiagnosis)**

**Session:2021-24**

**Program Code:SMS1401**

## 1. Standard Structure of the Program at University Level

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### 1.1 Vision, Mission and Core Values of the University

#### **Vision of the University**

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

#### **Mission of the University**

1. Transformative educational experience
2. Enrichment by educational initiatives that encourage global outlook
3. Develop research, support disruptive innovations and accelerate entrepreneurship
4. Seeking beyond boundaries

### **Core Values**

- Integrity
- Leadership
- Diversity
- Community

## **1.2 Vision and Mission of the School**

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### **Vision of the School**

To serve the society by being a premier institute that promotes a comprehensive approach to human health through excellence in academics, research and clinical care

### **Mission of the School**

- Provide a transformative educational experience in Medical Science
- Develop skills and competencies to create global leaders in clinical care
- Promote innovative and collaborative research through intellectual and technological advancement
- Establish a center for excellence in preventive, promotive and curative health care

### **Core Values**

- Integrity
- Leadership
- Ethics
- Community Health

### 1.3 Programme Educational Objectives (PEO)

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#### 1.3.1 Programme Educational Objectives (PEO)

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Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

A post graduate student having qualified the MD (Radiodiagnosis) examination should be able to:

PEO1 become a skilled and competent radiologist to conduct and interpret various diagnostic/interventional imaging studies (both conventional and advanced imaging),

PEO2 .to organize and conduct research and teaching activities

PEO3.be well versed with medical ethics and legal aspects of imaging/ intervention.

#### 1.3.2 Map PEOs with Mission Statements:

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PEO Statements	School Mission 1	School Mission 2	School Mission 3	School Mission 4
<b>PEO1:</b>	3	3	2	3
<b>PEO2:</b>	3	2	3	3
<b>PEO3:</b>	3	1	3	3

Enter correlation levels 1, 2, or 3 as defined below:

- 1. Slight (Low)    2. Moderate (Medium)    3. Substantial (High)**

If there is no correlation, put “-“

### 1.3.3 Program Outcomes (PO's)

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#### A. Cognitive Domain

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

- PO1. 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.
- PO2. Independently conduct and interpret all routine and special radiologic and imaging investigations.
- PO3. provide radiological services in acute emergency and trauma including its medicolegal aspects.
- PO4. 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.
- PO5. Decide on the various image-guided interventional procedures to be done for diagnosis and therapeutic management and acquire knowledge of interventional radiology.
- PO6. 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.
- PO7. Able to formulate basic research protocols and carry out research in the field of radiology-related clinical problems.
- PO8. 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.
- PO9. interact with other specialists and super-specialists so that maximum benefit accrues to the patient and. Should be able to organize CME activities in the specialty utilizing modern methods of teaching and evaluation.
- PO10. 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

#### B. Affective Domain:

- PO11. 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.
- PO12. 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.

- PO13. 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:

- PO14. 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 genitorurinary 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.
  10. ENT, EYE and Dental Imaging.
  11. Imaging of endocrine glands and those involved with metabolic diseases.
  12. Clinical applied radionuclide imaging.
  13. Interventional Radiology

PO15. 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); 4 fistulogram; sialogram; cologram/ileostogram
2. GU: Excretory urography, MCU, RGU, nephrostogram, genitogram

3. Ultrasound: Studies of whole body including neonatal transfontanell 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;

### 1.3.4 Mapping of Program Outcome Vs Program Educational Objectives

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	PEO1	PEO2	PEO3
PO1	3	2	1
PO2	3	1	“”
PO3	3	“”	1
PO4	3	“”	1
PO5	3	“”	“”
PO6	3	“”	“”
PO7	1	3	3
PO8	3	2	“”
PO9	3	2	“”
PO10	3	2	1

PO11	3	3	1
PO12	“”	“”	1
PO13	“”	“”	2
PO14	3	“”	“”
PO15	3	2	“”

*1. Slight (Low)*

*2. Moderate (Medium)*

*3. Substantial (High)*

## ***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.

### **ASSESSMENT**

**FORMATIVE ASSESSMENT**, during the training programme

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self directed learning and ability to practice in the system. General Principles Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and practical/clinical examination.

Quarterly assessment during the MD training should be based on:

1. Journal based / recent advances learning
  2. Patient based /Laboratory or Skill based learning
  3. Self directed learning and teaching
  4. Departmental and interdepartmental learning activity .
  5. External and Outreach Activities / CMEs
- The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

**SUMMATIVE ASSESSMENT**, i.e., assessment at the end of training The summative examination would be carried out as per the Rules given in POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000. Postgraduate Examination The Post Graduate Examination will conducted in three parts.

1. Thesis: Every post graduate student shall carry out work on an assigned research project under the guidance of a recognized Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis (Dissertation). Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature. Thesis shall be submitted at least six months before the Theory and Clinical / 9 Practical examination. The thesis shall be examined by a minimum of two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the examiners.
2. Theory Examination The examinations shall be organized on the basis of 'Grading' or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D. shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

There shall be four theory papers:

Paper I: Basic sciences related to Radiology (consists of Anatomy, Pathology, Basic and Radiation Physics, Imaging Techniques, and Film processing).

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Paper II: Chest, CVS, CNS including Head & Neck, Eye, ENT, musculo-skeletal, pediatric radiology and Mammography.

Paper III: Abdominal Imaging including GI, GU, Hepatobiliary, endocrine and metabolic, Obstetrics and Gynaecology and Interventional radiology

Paper IV: Recent advances, nuclear medicine; Radiology related to clinical specialties All papers would consist of short answer questions (minimum 10) covering all aspects of the course.

3. Practical/clinical and oral Examination (will include cases, spots, ultrasound procedure, physics, implements etc) Practical Examination will have: 1. 3-4 Cases 2. Film Quiz (50 – 60 Spots) 3. To perform Ultrasound on a patient Oral/Viva voce will include: - Radiation Physics and quality assurance - Implements, Catheters and contrast - Cassettes, films, dark room, equipment - Radiographic techniques, Radiological procedures, - Gross pathology

**Suggested Reading: Books (latest edition)**

1. Grainger & Allison's Text book of Diagnostic Radiology (Churchill Livingstone)
2. Textbook of Gastrointestinal Radiology- Gore and Levine (Saunders)
3. MRI of Brain and Spine - Scott Atlas (LWW)
4. Diagnosis of Diseases of the Chest -Fraser
5. Diagnostic Imaging Series: (Amirsys, Elsevier) Abdominal Imaging, Orthopedics, Head and Neck, Neuroradiology, Pediatric Radiology Chest, Obstetrics, Breast
6. MRI in Orthopedics and Sport Injuries - Stoller
7. Skeletal Radiology - Greenspan
8. Abdominal-Pelvic MRI - Semelka (IWW)
9. Caffey's Pediatric Radiology
10. CTI and MRI of the whole body- John R. Haaga
11. Text Book of Radiology and imaging - Davod sulton
12. Diagnostic ultrasound - Carol C. Rumack
13. AIIMS-MAMC-PGI's Comprehensive Textbook of Diagnostic Radiology, Volumes 1, 2, 3

**Annexure 1**
**Postgraduate Students Appraisal Form  
 Pre / Para /Clinical Disciplines**

Name of the Department/Unit :

Name of the PG Student :

Period of Training : FROM.....TO.....

Sr. No.	PARTICULARS	Not Satisfactory			Satisfactory			More Than Satisfactory			Remarks
		1	2	3	4	5	6	7	8	9	
1.	Journal based / recent advances learning										
2.	Patient based /Laboratory or Skill based learning										
3.	Self directed learning and teaching										
4.	Departmental and interdepartmental learning activity										
5.	External and Outreach Activities / CMEs										
6.	Thesis / Research work										
7.	Log Book Maintenance										

Publications

Yes/ No

Remarks\*

\*REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE of ASSESSEE

SIGNATURE OF CONSULTANT

SIGNATURE OF HOD