KHYBER MEDICAL UNIVERSITY

RADIOLOGY TECHNOLOGY CURRICULUM

STUDY GUIDE SEMESTER 6

16 Weeks Activity Planner

2024-25

CENTRAL CURRICULUM & ASSESSMENT COMMITTE FOR NURSING,
REHABILITATION SCIENCES & ALLIED HEALTH SCIENCES

Contents

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	Name	Designation
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Vision & Mission

Khyber Medical University (KMU) Vision:

Khyber Medical University will be the global leader in health sciences academics and research for efficient and compassionate health care.

Khyber Medical University (KMU) Mission:

Khyber Medical University aims to promote professional competence through learning and innovation for providing comprehensive quality health care to the nation.

Institute of Paramedical Sciences Peshawar (IPMS-PESH) Mission:

To produce allied health professionals who excel in their skills, research, compassionate care, and community involvement, thereby enhancing the healthcare system

Program Introduction

The BS Radiology Technology program at Khyber Medical University is a comprehensive four-year undergraduate degree designed to equip students with the knowledge, skills, and competencies required to become competent radiologic technologists. Radiology technology is a vital healthcare profession that focuses on the diagnosis and treatment of diseases using medical imaging modalities such as X-ray, CT, MRI, and ultrasound.

Radiologic technologists work closely with patients, healthcare providers, and other medical professionals to provide high-quality images and patient care. This program is structured to provide students with a strong foundation in the sciences and specialized training in radiologic technology.

Students will learn about the principles of radiation physics, radiobiology, patient assessment, and the latest techniques and technologies used in medical imaging. Throughout the four-year program, students will participate in clinical rotations and internships at top-tier hospitals and healthcare facilities, where they will gain hands-on experience in patient care and develop the skills necessary to work effectively in a fast-paced healthcare environment.

Upon completion of the program, graduates will be eligible to take the American Registry of Radiologic Technologists (ARRT) certification exam and will be qualified to work as registered technologists in radiography, CT, MRI, mammography, or other specialized imaging modalities.

Objectives

By the end of the BS Radiology Degree, the students will be able to:

Cognitive Domain

1. Explain the principles of radiation physics, radiobiology and imaging modalities.
2. Interpret pertinent clinical information to select appropriate imaging procedures and protocols for pediatric, neonatal and adult patients.
3. Identify potential expanded roles for radiologic technologists by examining professional behavior, ethics, and the history of the field.
4. Discuss the current professional and clinical roles in radiologic technology.
5. Apply knowledge of the field to address current or future needs related to clinical practice, administration, education, and/or research.

Psychomotor Domain

1. Demonstrate proficiency in operating radiologic equipment, including X-ray, CT, MRI, ultrasound and other imaging modalities
2. Perform patient assessments and provide quality care during imaging procedures, ensuring patient safety and comfort.
3. Work collaboratively with inter-professional teams to deliver effective, patient-centered care.
4. Develop the skills necessary to work efficiently in a fast-paced healthcare environment.

Affective Domain

1. Exhibit professional behavior and adhere to ethical values in the delivery of clinical radiography.
2. Incorporate an evidence-based approach to patient care by identifying and accessing appropriate literature and assessing relevant medical research.
3. Demonstrate leadership skills in the radiology profession, healthcare, and the community.
4. Engage in continuous learning and professional development to stay current with the latest advancements in the field of radiology.
5. Provide compassionate and patient-centered care that respects the dignity and autonomy of each individual

Sixth Semester Subjects for BS Radiology Technology

S. No	Subjects	Duration
1	RAD-615 Radiological & Cross sectional Anatomy Credit Hours 3 (2+1)	16 weeks
2	RAD-616 CT Procedures & Clinical Practice Credit Hours 3 (2+1)	16 weeks
3	RAD-617MRI Procedures & Clinical Practice Credit Hours 3 (2+1)	16 weeks
4	RAD-618 Therapeutic Radiology Credit Hours 3 (2+1)	16 weeks
5	RAD-621 Nuclear Medicine Credit Hours 3 (2+1)	16 weeks
6	RAD-621 Clinical Pathology & Radiological Presentation-I Credit Hours 2(1+1)	16 weeks

RAD-615 Radiological And Cross-Sectional Anatomy 3(2+1)

Course Description

This course introduces students to the fundamental concepts of radiological and cross sectional anatomy. Students will learn about the gross & radiological anatomy in order to enhance understanding of cross sectional anatomy on radiographs of CT and MRI.
The course will cover anatomical structures with their radiographic appearance and interpretation techniques. By the end of the course, students will develop practical skills for labeling, identification and interpretation of radiographs on CT and MR.

Learning Objectives

Cognitive Domain

By the end of this course, students should be able to

1. Explain the fundamental values of radiological and cross sectional anatomy of identification and interpretation.
2. Describe the interpretation techniques of radiological and cross sectional anatomy, including CT images & MR images.
3. Demonstrate an understanding of Cross Sectional anatomy in CT and MR images, including normal anatomy of different region.
4. Analyze and interpret CT and MR images for various clinical conditions normal and abnormal including traumatic injuries, cancers and vascular diseases.

Psychomotor Domain

By the end of this course, students should be able to

1. Recognize, label and interprets CT and MR effectively.
2. Identify and label key anatomical structures (organs, tissues, blood vessels, and bones) on CT and MRI images, considering their spatial relationships in cross-sectional anatomy.
3. Select and apply appropriate interpretation techniques for CT images and MR images for various anatomical regions of the body.
4. Assist contrast agents as an enhancer for CT/MR images for identifications.

Affective Domain

By the end of this course, students should be able to

1. Demonstrate punctuality
2. Follow the specified norms of the IL, SGD teaching & learning effectively
3. Demonstrate humbleness and use socially acceptable language during academic and social interactions with human models, colleagues, and teachers.
4. Demonstrate

ethically competent decisions when confronted with an ethical, social, or moral problem in professional or personal life
5. Comply with SOPs of practical & procedure effectively

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TABLE OF SPECIFICATIONS

TOS- Radiological And Cross-Sectional Anatomy 3 (2+1)

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC: BRAIN ANATOMY ON CT										
1	Week-1	Axial plane	Explain brain anatomy in axial plane on CT images	C2			Interactive Lecture/SDG	2	MCQs	4
2		Sagittal and coronal planes	Describe brain anatomy in sagittal and coronal planes on CT images	C3						
3		Comparison of anatomy	Discuss and compare general and cross sectional anatomy	C2						
4		Practical Performance	Demonstration of Cranial CT images in skill lab through radiographs and videos		P4		Demo	1	OSPE	1
5		SOPs Compliance	Adopt how to recognize and label of different cranial structure in CT images			A4	Role Play			
TOPIC: Brain Anatomy on MRI										
6	Week-2	Axial plane	Explain brain anatomy in axial planes on MR images	C3			Interactive Lecture/SDG	2	MCQs	6
7		Sagittal and coronal planes	Describe brain anatomy in sagittal and coronal planes on MR images	C2						
8		Comparison of anatomy	Discuss and compare general and cross sectional anatomy	C2						
9		Practical Performance	Demonstration of Cranial MR images in skill lab through radiographs and videos		P4		Demo	1	OSPE	1
10		SOP's Compliance	Adopt how to recognize and label of different cranial structure in MRI images			A4	Role Play			
TOPIC: Cranial Angiographic Anatomy on MR										
11	Week-3	Major arteries & branches	Explain different branches of major arteries (Circle of willis) in MR arteriography images	C3			Interactive Lecture/SDG	2	MCQs	8
12		Major veins & branches	Describe different branches of major Veins (Sinus system) in MR venography images	C3						
13		2D & 3D, arteriography & venography	Describe 3D and Cross sectional images of MR arteriography and venography.	C3						
14		Practical Performance	Demonstration of MRA & MRV 3D Images through charts/radiographs/videos		P4		Demo	1	OSPE	2
15		SOP's Compliance	Adopt how to identify the major vessel origination and supply or drainage			A4	Role Play			
TOPIC: NECK ANATOMY ON CT & MRI										

16	Week-4	Nek anatomy on CT	Explain neck anatomy in CT images	C3			Interactive Lecture/SDG	2	MCQs	4
17		Axial, sagittal & coronal planes on MR	Describe anatomy of various planes (axial, sagittal & coronal) on MR images	C3						
18		MRA neck	Explain 3D Images of MRA Neck	C2						
19		Practical Performance	Demonstrate and identify (intense, hypo-intense and hyper-intense) of neck structure through MR images, CT images and videos		P4		Demo	1	OSPE	1
20		SOP's Compliance	Adopt how to label and interpret neck anatomy images			A4	Role Play			
TOPIC: C-SPINE AND T-SPINE ANATOMY ON CT AND MR										
21	Week-5	Axial, sagittal & coronal planes on MR	Describe anatomy of C-spine and T-spine in various planes (axial, sagittal & coronal) in MR images	C2			Interactive Lecture/SDG	2	MCQs/SEQs	6
22		C-spine and T spine in CT images	Discuss anatomy of C-spine and T spine in CT images	C3						
23		Parameters & contrast sequences	Explain parameters and contrast sequences of C-spine and T-spine	C2						
24		Practical Performance	Demonstrate and identify C-spine and T-spine anatomy in CT & MR images		P4		Demo	1	OSPE	1
25		SOP's Compliance	Adopt how to label and interpret C-spine and T-spine anatomy in CT & MR images			A4	Role Play			
TOPIC: LUMBOSACRAL SPINE ANATOMY ON CT AND MR										
26	Week-6	Various plane on CT & MR images	Describe anatomy of lumbosacral spine in various planes of in CT and MR images	C3			Interactive Lecture/SDG	2	MCQs/SEQs	4
27		Axial plane on CT & MR images	Discuss anatomy of lumbosacral spine in axial images of CT & MR	C2						
28		Contrast sequences	Explain contrast sequences of lumbosacral spine	C3						
29		Practical Performance	Demonstrate and identify lumbosacral spine anatomy through charts/radiographs/videos		P4		Demo	1	OSPE	1
30		SOP's Compliance	Adopt how to identify, interpret and label lumbosacral spine anatomy			A4	Role Play			
TOPIC: THORACIC ANATOMY ON CT										
31	Week-7	Thoracic anatomy	Discuss thoracic anatomy in CT images	C3			Interactive Lecture/SDG	2	MCQs	4
32		Axial, coronal & sagittal planes on CT	Describe thoracic anatomy in axial, coronal and sagittal planes	C2						
33		Thoracic with contrast	Explain anatomy of thoracic with contrast in CT images	C2						
34		Practical Performance	Demonstrate and identify chest anatomy in radiology lab through charts/radiographs/videos		P4		Demo	2	OSPE	1
35		SOP's Compliance	Adopt how to identify, interpret and label thoracic anatomy			A4	Role Play			
TOPIC: THORACIC ANATOMY ON MR										
36	Week-8	Thoracic anatomy	Discuss thoracic anatomy in MR images	C2			Interactive	2	MCQs	4

37		Axial, coronal & sagittal planes on MR	Describe thoracic anatomy in axial, coronal and sagittal planes	C2			Lecture/SDG			
38		Contrast sequences	Explain anatomy of abdomen with contrast sequence in MR images	C3						
39		Practical Performance	Demonstrate and identify abdominal anatomy in radiology lab through charts/radiographs/videos		P4		Demo	1	OSPE	1
40		SOP's Compliance	Adopt how to identify, interpret and label thoracic anatomy			A4	Role Play			
TOPIC: ABDOMINAL ANATOMY ON MR										
41	Week-9	Abdominal anatomy	Explain abdominal anatomy in MR images	C2			Interactive Lecture/SDG	2	MCQs	4
42		Axial, coronal & sagittal planes on MR	Describe anatomy of abdomen in axial, coronal and sagittal planes of MR	C2						
43		Abdomen with contrast	Discuss anatomy of abdomen with contrast sequence in MR images	C2						
44		Practical Performance	Demonstrate and identify abdominal anatomy in radiology lab through charts/radiographs/videos		P4		Demo	1	OSPE	**1**
45		SOP's Compliance	Adopt how to interpret and label abdominal anatomy on radiographs			A4	Role Play			
TOPIC: ABDOMINAL ANATOMY ON CT										
46	Week-10	Abdominal anatomy	Explain abdominal anatomy in CT images	C2			Interactive Lecture/SDG	2	MCQs/SEQs	2
47		Axial, coronal & sagittal planes on CT	Describe anatomy of abdomen in coronal and sagittal planes of CT	C3						
48		Abdomen with contrast	Discuss anatomy of abdomen with contrast images of CT	C3						
49		Practical Performance	Demonstrate and identify abdominal anatomy in radiology lab through charts/radiographs/videos		P4		Demo	1	OSPE	1
50		SOP's Compliance	Adopt how to interpret and label abdominal anatomy on radiographs			A4	Role Play			
TOPIC: MRCP, ANGIOGRAPHIC ANATOMY OF THORAX & ABDOMEN										
51	Week-11 & Week-12	Angiographic anatomy	Explain angiographic anatomy of thorax and abdomen in CT & MR images	C2			Interactive Lecture/SDG	4	MCQs/SEQs	8
52		Arteries, veins & their branches	Describe artery, vein and their branches in CT and MR images	C2						
53		Biliary tree anatomy	Discuss biliary tree anatomy in MRCP images	C3						
54		Practical Performance	Demonstrate and identify angiographic anatomy of thorax and abdomen in CT and MR images		P4		Demo	1	OSPE	1
55		SOP's Compliance	Adopt how to Utilize Charts/radiography for vessel labeling and interpretation			A4	Role Play			
TOPIC: ANATOMY OF UPPER AND LOWER LIMB EXTREMITIES										
56	Week-13	Upper limb anatomy	Explain upper limb anatomy in CT/MR images	C2			Interactive Lecture/SDG	2	MCQs	4
57		Lower limb anatomy	Describe lower limb anatomy in CT /MR images	C2						

58		Anatomy in various planes	Discuss angiographic upper and lower limb anatomy in different planes in CT/MR images	C3						
		Practical Performance	Demonstrate and identify angiographic anatomy of upper and lower limb in CT/MR images		P4		Demo	1	OSPE	**0**
		SOP's Compliance	Adopt how to Utilize Charts/radiographs/models for vessel labeling and interpretation			A4	Role Play			
TOPIC: SHOULDER JOINT ANATOMY ON MRI										
59	Week-14	Shoulder anatomy in coronal & sagittal plane	Explain anatomy of shoulder joint in coronal and sagittal planes of MR images	C3			Interactive Lecture/SDG	2	MCQs	4
60		Anatomy in axial	Describe anatomy of shoulder joint in axial images	C2						
61		Contrast sequences	Discuss anatomy of shoulder joint in contrast sequence images	C2						
62		Practical Performance	Demonstrate and identify joint anatomy in radiology lab through charts/radiographs/videos		P4		Demo	1	OSPE	0
63		SOP's Compliance	Adopt how to recognize shoulder joint movements and interpretation			A4	Role Play			
TOPIC: HIP JOINT AND KNEE JOINT ON MRI										
64	Week-15	Hip joint & knee joint anatomy in sagittal	Explain anatomy of hip joint and knee joint in sagittal plane of MR images	C2			Interactive Lecture/SDG	2	MCQs	6
65		Anatomy in axial & coronal plane	Describe anatomy of hip joint and knee joint in axial and coronal planes	C3						
66		Contrast sequences	Discuss anatomy of hip & knee joint in contrast sequence images of MRI	C2						
67		Practical Performance	Demonstrate and identify joint anatomy of hip joint and knee joint in radiology lab through charts/radiographs/videos		P4		Demo	1	OSPE	**1**
68		SOP's Compliance	Adopt how to recognize knee joint movements and interpretation			A4	Role Play			
TOPIC: PELVIC ANATOMY ON MR & CT										
69	Week-16	Pelvic anatomy	Explain pelvic anatomy in CT/MR images	C1			Interactive Lecture/SDG	2	MCQs/SEQs	6
70		Pelvic anatomy in various planes	Describe anatomy of pelvis in axial and coronal planes	C2						
71		Contrast sequences	Discuss anatomy of pelvis in contrast sequence images or with contrast CT images	C3						
72		Practical Performance	Demonstrate and identify pelvic anatomy in radiology lab through charts/radiographs/videos		P4		Demo	1	OSPE	1
73		SOP's Compliance	Adopt how to label , identify and interpret pelvic anatomy in CT & MR images			A4	Role Play			

Recommended Books:
1. https://mrimaster.com
2. Pocket Atlas of Sectional Anatomy (Computed Tomography and Magnetic Resonance Imaging) by T.B Moeller, E.Rief Volume I,II,II 3rd Edition
3. Atlas of Radiological anatomy, Author: Weir Abrahams 2nd edition by Churchill living stone

ASSESSMENT BREAKDOWN				
S.No	**Topics**	**No of MCQ**	**No of OSPE / OSCE Stations**	**Static / Interactive**
1	**Brain Anatomy on CT**	4	1	Static
2	**Brain Anatomy on MRI**	6	1	Static
3	**Cranial Angiographic Anatomy on MR**	7	1	Static and Interactive
4	**Neck Anatomy on CT & MRI**	4	1	Static
5	**C-spine and T-spine Anatomy on CT and MR**	6	1	Static and Interactive
6	**Lumbosacral spine Anatomy on CT and MR**	4	1	Static and Interactive
7	**Thoracic Anatomy on CT**	4	1	Static
8	**Thoracic Anatomy on MRI**	4	1	Static
9	**Abdominal Anatomy on MR**	4	1	Static and Interactive
10	**Abdominal Anatomy on CT**	2	1	Interactive
11	**Angiographic Anatomy of Thorax & Abdomen**	4	1	Static and Interactive
12	**MRCP**	4	1	Static
13	**Anatomy of Upper & lower limb extremities**	3	0	Static
14	**Shoulder joint Anatomy on MRI**	4	0	Static
15	**Hip joint and Knee joint on MRI**	6	1	Interactive
16	**Pelvic anatomy on MR & CT**	4	1	Static and Interactive
Total	**16**	**70**	**14**	**14**

RAD-616 CT Procedure And Clinical Practice 3(2+1)

Course Description

This course introduces students to the fundamental concepts of computed tomography (CT) procedures and clinical practice. Students will learn about the principles of CT imaging, including scanner operations, image acquisition, and reconstruction techniques. The course will cover CT imaging protocols for various body regions, image analysis and interpretation for common clinical conditions, radiation safety, and dose reduction strategies. By the end of the course, students will develop practical skills necessary for competent CT imaging practice, including patient assessment and care.

Learning Objectives

Cognitive Domain

By the end of this course, students should be able to

1. Describe the fundamental principles of computed tomography (CT), including scanner operations and image reconstruction.
2. Discuss the clinical applications of CT imaging, including protocols for various body regions and patient populations.
3. Explain the technical factors that affect CT image quality, including radiation dose, contrast agents, and artifact reduction.
4. Demonstrate an understanding of CT imaging procedures, including patient preparation, positioning, and safety considerations.
5. Analyze and interpret CT images for various clinical conditions, including traumatic injuries, cancers, and vascular diseases.

Psychomotor Domain

By the end of this course, students should be able to

1. Operate CT scanners and associated equipment safely and effectively.
2. Position patients correctly for CT examinations, taking into account factors such as patient comfort and image quality.
3. Select and apply appropriate CT protocols and scanning parameters for various clinical indications.
4. Assist in administering contrast agents and other medications as required for CT examinations.
5. Use CT image processing software to reconstruct and manipulate images for diagnostic purposes.

Affective Domain

By the end of this course, students should be able to

1. Demonstrate respect for patients' dignity and confidentiality during CT procedures.
2. Adhere to professional standards and protocols for CT procedures, including radiation safety and infection control.
3. Demonstrate a commitment to ongoing learning and professional development in CT procedures and clinical practice
4. Collaborate effectively with radiologists, technologists, and other healthcare professionals to ensure high-quality patient care.
5- Comply with SOPs of practical & procedures effectively

TABLE OF SPECIFICATIONS

TOS- CT Procedure And Clinical Practice 3 (2+1)

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC: PATIENT PREPARATION										
1	Week-1	Patient preparation	Describe the steps of patient preparation in CT imaging	C2			Interactive Lecture/SDG	2	MCQs	**2**
2		Medical History	Describe the key elements of a patient's medical history	C2						
3		Protocol selection	Describe the process of protocol selection for CT exams	C2						
4		Laboratory values	Discuss the role of laboratory values in patient preparation for CT exams	C2						
5		Preparation of CT room	Discuss the steps involved in preparing the CT room for patient examination	C2						
6		Videos/Charts/Models	Demonstrate patient preparation technique for CT examination.		P4		Demo	1	OSPE	1
7		SOP's Compliance	Adopt a structured approach to patient verification and reviewing their medical history			A4	Role Play			
TOPIC: PATIENT EDUCATION										
8	Week-2	Patient education	Explain the importance of patient education and informed consent in CT imaging	C3			Interactive Lecture/SDG	2	MCQs	3
9		Patient's consent	Describe the process of obtaining informed consent from patients undergoing CT exams	C2						
10		Laboratory values	Discuss the role of laboratory values in patient preparation for CT exams	C2						
11		Vital signs	Describe the Assessment and Monitoring of Vital Signs	C2						
12		Videos/Charts/Models	Demonstrate how to interact with patient undergoing CT examination.		P4		Demo	1	OSPE	2
13		SOP's Compliance	Adopt how to obtain informed consent and check for vital signs.			A4	Role Play			
TOPIC: CONTRAST AGENTS										
14	Week-3	Contrast Agents	Describe the types of contrast agents used.	C2			Interactive Lecture/SDG	2	MCQs	3
15			Discuss the properties of intravascular contrast agents.	C2						
16		Adverse effects	Describe the adverse effects of contrast agents, including chemo toxic reactions.	C2						
17		Contrast induced nephropathy	Explain contrast induced nephropathy and its risk factors	C3						
18		Prevention	Discuss methods for preventing contrast-induced nephropathy.	C2						
19		Risk factors	Discuss the risk factors for adverse reactions to contrast agents.	C2						
20		Prevention	Explain preventive measures for minimizing adverse reactions.	C3						
21		Videos/Charts/Models	Demonstrate through video different types of contrast agents used in CT and their uses		P4		Demo	1	OSPE	2
22		SOP's Compliance	Adopt how to handle IV lines and contrast agents			A4	Role Play			
TOPIC: ADVERSE EFFECTS OF CONTRAST AGENTS										
23	Week-4	Effects of contrast media	Describe the effects of contrast media on thyroid function.	C2			Interactive Lecture/SDG	2	MCQs	3

24		Effects of contrast media	Discuss the pulmonary and central nervous system effects of contrast media.	C2						
25		Types of contrast agent	Describe the types of contrast agent (Gastrointestinal) solutions for oral administration	C2						
26		Administration	Describe intrathecal contrast media administration	C2						
27		Videos/Charts/Models	Demonstrate different routes of contrast administration in CT examination through videos		P4		Demo	1	OSPE	2
28		SOP's Compliance	Adopt how to handle idiosyncratic reactions			A4	Role Play			
TOPIC: INJECTION TECHNIQUES										
29	Week-5	Vascular access	Describe different types of vascular access	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
30		Basic principles	Explain Basic Principles of Intravenous Contrast Administration	C3						
31		Types	Discuss the different types of injection techniques	C2						
32		Advantages and disadvantages	Describe the advantages and disadvantages of each injection technique.	C2						
33		Videos/Charts/Models	Demonstrate different needles used in CT examination techniques through video.		P4		Demo	1	OSPE	
34		SOP's Compliance	Adopt how to handle IV lines and power injector.			A4	Role Play			2
TOPIC: FACTORS AFFECTING INJECTION TECHNIQUES										
35	Week-6	General phases	Describe the general phases of tissue enhancement	C2			Interactive Lecture/SDG	2	MCQs	5
36		Factors	Describe the Factors Affecting Contrast Enhancement.	C2						
37		Injection rates and pressures	Explain the factors that influence injection rates and pressures.	C3						
38		Videos/Charts/Models	Demonstrate through video different phases of contrast enhancement in different structures		P4		Demo	1	OSPE	3
39		SOP's Compliance	Adopt how to reduce risks of infection associated with injection techniques.			A4	Role Play			
TOPIC: NEUROLOGICAL IMAGING PROCEDURES										
40	Week-7	Protocols of head	Describe the general imaging methods for the head (axial, coronal, sagittal).	C2			Interactive Lecture/SDG	2	MCQs	5
41		Protocols of neck	Describe the CT protocols for imaging the neck	C2						
42		CTA protocols for head and neck	Describe the CT angiography (CTA) protocols for imaging the head and neck.	C2						
43		Protocols of spine	Describe the CT protocols for imaging the spine	C2						
44		Stroke	Describe stroke in detail	C2						
45		Videos/Charts/Models	Demonstrate through video examination technique of head, neck and spine.		P4		Demo	1	OSPE	3
46		SOP's Compliance	Adopt how to handle patients with neurological conditions in CT unit.			A4	Role Play			
TOPIC: PERFUSION SCAN										
47	Week-8	Protocols of stroke	Describe the CT protocols for imaging stroke (e.g., non-contrast, contrast-enhanced)	C2			Interactive Lecture/SDG	2	MCQs	5
48		Technical factors	Describe the technical factors for CT brain perfusion scans.	C2						
49		CT perfusion procedure	Explain CT perfusion procedure in determining cerebral vascular reserve.	C3						
50			Describe the CT perfusion protocols used in conjunction with temporary balloon occlusion.	C2						
51		Videos/Charts/Models	Video demonstrate of intracranial hemorrhage on ct.		P4		Demo	1	OSPE	3

52		SOP's Compliance	Adopt how to position patient for neurological imaging procedures			A4	Role Play			
TOPIC: THORACIC IMAGING PROCEDURES										
53	Week-9	Thoracic scanning	Describe the thoracic scanning methods.	C2			Interactive Lecture/SDG	2	MCQs	8
54		CT protocols	Describe the CT protocols of normal airways.	C2						
55		HRCT protocols	Describe the HRCT protocols for imaging the lungs.	C2						
56		CTA protocols	Explain the CTA protocols for imaging pulmonary embolism.	C3						
57		Cardiac anatomy	Describe the cardiac anatomy.	C2						
58		Videos/Charts/Models	Demonstrate through video CT imaging protocols for lungs		P4		Demo	1	OSPE	4
		SOP's Compliance	adopt how to position patients for lungs and cardiac examination			A4	Role Play			
TOPIC: CARDIAC CT IMAGING										
59	Week-10	Cardiac CT	Describe the techniques used in cardiac CT imaging.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	7
60		Heart rate control	Explain the role of pharmacological heart rate control and ECG-gating	C3						
61		Calcium screening.	Explain the CT protocols for coronary calcium screening.	C3						
62		Videos/Charts/Models	Demonstrate prospective and retrospective ECG gating through videos		P4		Demo	1	OSPE	3
63		SOP's Compliance	Adopt how to administer pharmacological doses to patients undergoing CT			A4	Role Play			
TOPIC: ABDOMEN & PELVIS IMAGING PROCEDURES										
64	Week-11& Week-12	Scanning methods	Describe the general abdominopelvic scanning methods.	C2			Interactive Lecture/SDG	4	MCQs/SEQs	12
65		CT protocols	Describe the CT protocols for liver.	C2						
66		CT findings	Explain the CT findings in various liver diseases	C3						
67		Anatomy of the pancreas	Describe the normal anatomy of the pancreas and it's CT protocols	C2						
68		CT findings	Explain the CT findings in various pancreatic diseases	C3						
69		CT protocols	Describe the CT protocols of kidney and ureter	C2						
70		CT findings	Explain the CT findings in various kidney and ureter diseases.	C3						
71		Videos/Charts/Models	Video demonstrate of triphasic CT in liver and pancreas		P4		Demo	2	OSPE	6
72		SOP's Compliance	Adopt how to calibrate power injector for organ specific flow			A4	Role Play			
TOPIC:ADRENAL GLAND & APENDIX CT PROCEDURES										
73	Week-13	Adrenal gland	Describe the anatomy and physiology of the adrenal glands.	C2			Interactive Lecture/SDG	2	MCQs	3
74		Diseases	Describe Adrenal gland diseases	C2						
75		Characterization	Explain the characterization of adrenal masses.	C3						
		Acute appendicitis	Describe the pathogenesis and clinical presentation of acute appendicitis.	C2						
		Videos/Charts/Models	Demonstrate through CT images appearance of acute appendicitis and characterization of adrenal masses.		P4		Demo	1	OSPE	**1**
		SOP's Compliance	Adopt how to care and handle radiographs			A4	Role Play			
TOPIC: APPENDIX & UT CALCULI SCAN										

76	Week-14	Laboratory tests and imaging studies	Explain the laboratory tests and imaging studies used in diagnosing acute appendicitis.	C3			Interactive Lecture/SDG	2	MCQs	5
77		CT protocols	Describe the CT protocols for imaging acute appendicitis.	C2						
78		Urinary tract calculi	Discuss the diagnosis and treatment of urinary tract calculi.	C2						
79		CT protocols	Explain CT protocols for urinary tract calculi.	C3						
80		Videos/Charts/Models	Demonstrate through video selection and application of CT protocols for urinary tract calculi		P4		Demo	1	OSPE	
81		SOP's Compliance	Adopt how to position patient for CT appendix procedure			A4	Role Play			3
TOPIC: MSK UPER LIMB IMAGING PROCEDURES										
82	Week-15	Scanning methods	Describe the general musculoskeletal scanning methods.	C2			Interactive Lecture/SDG	2	MCQs	3
83		Proper patient positioning	Explain the importance of proper patient positioning.	C3						
84		CT protocols	Discuss the CT protocols for wrist imaging.	C2						
85			Discuss the CT protocols for shoulder imaging.	C2						
86		Videos/Charts/Models	Demonstrate through video CT scanning procedure for wrist and shoulder examination		P4		Demo	1	OSPE	**1**
87		SOP's Compliance	Adopt how to position patient for wrist and shoulder exam.			A4	Role Play			
TOPIC: MSK LOWER LIMB IMAGING PROCEDURES										
88	Week-16	CT protocols	Discuss the CT protocols for knee imaging.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	2
89			Discuss the CT protocols for foot imaging	C2						
90			Discuss the CT protocols for ankle imaging	C3						
91		Videos/Charts/Models	Demonstrate through video CT protocols for lower leg including knee, ankle and foot		P4		Demo	1	OSPE	1
92		SOP's Compliance	Adopt how to position patient for lower limb scanning			A4	Role Play			

Recommended Books:

1. Computed Tomography for Technologists by Lois E. Romans
2. A guide to radiological procedure by Stephen Chapman & Richard Nakielny 3rd edition
3. Rad Tech's Guide to CT: Imagine Procedures, Patient Care and Safety (Rad Tech Series) Deborah L. Durham

ASSESSMENT BREAKDOWN				
S.No	Topics	No of MCQ	No of OSPE / OSCE Stations	Static / Interactive
1	**Patient Preparation**	2	1	**Interactive**
2	**Patient Education**	3	1	**Interactive**
3	**Contrast Agents**	3	1	**Interactive**
4	**Adverse Effects of Contrast Agents**	3	1	**Static**
5	**Injection Techniques**	4	1	**Static**
6	**Factors Affecting Injection Techniques**	5	1	**Static**
7	**Neurological Imaging Procedures**	5	1	**Static and interactive**
8	**Perfusion Scan**	5	1	**Static**
9	**Thoracic imaging procedures**	8	1	**Static**
10	**Cardiac CT imaging**	7	1	**Interactive**
11	**Abdomen and pelvis imaging procedures**	6	1	**Static and interactive**
12	**Abdomen and pelvis imaging procedures**	6	1	**Static and interactive**
13	**Adrenal gland and appendix CT procedure**	3	1	**Static**
14	**Appendix and UT calculi scan**	5	1	**Static**
15	**MSK upper limb imaging procedures**	3	1	**Static**
16	**MSK lower limb imaging procedures**	2	1	**Static**
Total		**70**	**14**	**14**

RAD-617 Magnetic Resonance Imaging (MRI) Procedures & Clinical Practice 3 (2+1)

Course Description

This course introduces students to the fundamental concepts of magnetic resonance imaging procedures and clinical practice. Students will learn about the principles of MR imaging, including scanner operations, image acquisition, and image reconstruction techniques. The course will cover MR imaging protocols for various body regions, image analysis and interpretation for common clinical conditions, safety and proper safe imaging strategies. After successful completion of this course, the students will be able to, exercise all aspects of MRI, including brain, neck, spine, cardiovascular, musculoskeletal and breast imaging. Develop independent skills in the performance and interpretation of magnetic resonance imaging studies. Use of contrast media and range of procedures undertaken in MRI.

Learning Objectives

Cognitive Domain

By the end of this course, students should be able to

5. Explain the fundamental values of magnetic resonance imaging (MRI), including scanning room, sequences and MR image reconstruction.
6. Describe the clinical applications of MR imaging, including MR parameters & protocols for different body parts of patients.
7. Discuss the MR parameters that affect MR image quality, including time, contrast resolution and spatial resolution
8. Demonstrate an understanding of MR imaging procedures, including patient preparation, positioning and MR safety. .
9. Analyze and interpret MR images for various clinical conditions, including traumatic injuries, cancers and vascular diseases.

Psychomotor Domain

By the end of this course, students should be able to

5. Operate MR machine and associated equipment safely and effectively.
6. Position patients correctly for MR examinations, taking into account factors such as patient comfort and image quality.
7. Select and apply appropriate MR sequences, protocols and scanning parameters for various procedures.
8. Assist in administering contrast agents as an enhancer for MR examinations.
9. Use MRI images processing software to reconstruct and manipulate images for diagnostic purposes.

Affective Domain

By the end of this course, students should be able to

1. Demonstrate punctuality
2. Follow the specified norms of the IL, SGD teaching & learning effectively
3. Demonstrate humbleness and use socially acceptable language during academic and social interactions with human models, colleagues, and teachers.
4. Demonstrate ethically competent decisions when confronted with an ethical, social, or moral problem in professional or personal life
5. Comply with SOPs of practical & procedure effectively

TABLE OF SPECIFICATIONS

TOS- MR Procedure And Clinical Practice 3 (2+1)

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC: MR BRAIN AND PITUITARY FOSSA										
1	Week-1	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of brain and pituitary fossa	C2			Interactive Lecture/SDG	2	MCQs	**6**
2		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences, planning of brain and pituitary fossa	C3						
3		Parameters & contrast sequences	Describe parameters and contrast sequences of brain and pituitary fossa	C2						
4		Practical performance	Demonstrate brain and pituitary imaging procedure through videos		P4		Demo	1	OSPE	1
5		SOPs Compliance	Adopt how to perform brain and pituitary MRI procedure			A4	Role Play			
TOPIC: MR EPILEPSY & ORBITS										
6	Week-2	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of epilepsy & orbits	C3			Interactive Lecture/SDG	2	MCQs	4
7		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences, planning of epilepsy & orbits	C2						
8		Parameters & contrast sequences	Describe parameters and contrast sequences of epilepsy & orbits	C2						
9		Practical Performance	Demonstrate epilepsy & orbits imaging procedure through videos		P4		Demo	1	OSPE	1
10		SOPs Compliance	Adopt how to perform epilepsy & orbits MRI procedure			A4	Role Play			
TOPIC: MR SOFT TISSUE NECK										
11	Week-3	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of soft tissue neck MRI	C2			Interactive Lecture/SDG	2	MCQs	4
12		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences, planning of soft tissue neck MRI	C2						
13		Parameters & contrast sequences	Explain parameters and contrast sequences of soft tissue neck MRI	C2						
14		Practical Performance	Demonstrate soft tissue neck imaging procedure through videos		P4		Demo	1	OSPE	1
15		SOPs Compliance	Adopt how to perform soft tissue neck MRI procedure			A4	Role Play			
TOPIC: MRA and MRV										

16	Week-4	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of MRA and MRV	C3			Interactive Lecture/SDG	2	MCQs	6
17		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences of MRA and MRV	C3						
18		Parameters & post processing	Explain parameters and post sequences of MRA and MRV	C2						
19		Practical Performance	Demonstrate MRA and MRV imaging procedure through videos		P4		Demo	1	OSPE	1
20		SOPs Compliance	Adopt how to perform MRA and MRV procedure			A4	Role Play			
TOPIC: C-SPINE AND T-SPINE										
21	Week-5	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of C-spine and T-spine	C2			Interactive Lecture/SDG	2	MCQs/SEQs	5
22		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences, planning of C-spine and T-spine	C3						
23		Parameters & contrast sequences	Explain parameters and contrast sequences of C-spine and T-spine	C2						
24		Practical Performance	Demonstrate C-spine and T-spine imaging procedure through videos		P4		Demo	1	OSPE	1
25		SOPs Compliance	Adopt how to perform C-spine and T-spine MRI procedure			A4	Role Play			
TOPIC: L-SPINE AND WHOLE-SPINE										
26	Week-6	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of L-spine and whole-spine	C2			Interactive Lecture/SDG	2	MCQs	5
27		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences of L-spine and whole-spine	C2						
28		Parameters & contrast sequences	Explain parameters and contrast sequences of L-spine and whole-spine							
29		Artifacts	Discuss artifacts reducing techniques	C3						
30		Practical Performance	Demonstrate L-spine and whole-spine imaging through videos		P4		Demo	1	OSPE	1
31		SOPs Compliance	Adopt how to perform L-spine and whole-spine MRI			A4	Role Play			
TOPIC: CARDIAC MRI										
32	Week-7 & Week-8	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of cardiac MRI	C3			Interactive Lecture/SDG	4	MCQs	4
33		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences of cardiac MRI	C2						
34		Parameters & contrast	Explain parameters and contrast of cardiac MRI	C2						
35		Calcium score	Discuss calcium score for MR							

36		Practical Performance	Demonstrate cardiac imaging procedure through videos		P4		Demo	2	OSPE	2
37		SOPs Compliance	Adopt how to perform cardiac MR procedure			A4	Role Play			
TOPIC: MRCP										
38	Week-9	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of magnetic resonance chalogiopancretography (MRCP)	C2			Interactive Lecture/SDG	2	MCQs	6
39		Positioning, localiser sequences & planning	Discuss positioning, localiser, sequences and planning of MRCP	C2						
40		Parameters & contrast sequences	Explain parameters and contrast sequences of MRCP	C3						
41		Practical Performance	Demonstrate MRCP imaging procedure through videos		P4		Demo	1	OSPE	1
42		SOPs Compliance	Adopt how to perform MRCP MRI procedure			A4	Role Play			
TOPIC: MR prostate										
43	Week-10	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of prostate MRI	C2			Interactive Lecture/SDG	2	MCQs	4
44		Positioning, localiser sequences & planning	Discuss positioning, localiser, sequences and planning of prostate MRI	C2						
45		Parameters & contrast sequences	Explain parameters and contrast sequences of prostate MRI	C2						
46		Practical Performance	Demonstrate prostate imaging procedure through videos		P4		Demo	1	OSPE	**1**
47		SOPs Compliance	Adopt how to perform prostate MRI procedure			A4	Role Play			
TOPIC: MRI FEMALE URETHRA										
48	Week-11	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of female urethra MRI	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
49		Positioning, localiser sequences & planning	Discuss positioning, localiser, planning and sequences of female urethra MRI	C3						
50		Parameters & contrast sequences	Explain parameters and contrast sequences of female urethra MRI	C3						
51		Videos/Charts/Models	Demonstrate female urethra imaging procedure through videos		P4		Demo	1	OSPE	1
52		SOP’s Compliance	Adopt how to perform female urethra MRI procedure			A4	Role Play			
TOPIC: MRI RECTAL CANCER										
53	Week-12	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of rectal cancer MRI	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
54		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences of rectal cancer MRI	C2						

55		Parameters & contrast sequences	Explain parameters and contrast sequences of rectal cancer MRI	C3						
56		Practical Performance	Demonstrate rectal cancer imaging procedure through videos		P4		Demo	1	OSPE	0
57		SOPs Compliance	Adopt how to perform rectal cancer MRI procedure			A4	Role Play			
TOPIC: MRI FOOT AND HAND										
58	Week-13	Indications, contra-indications & preparation	Describe indications, contra-indications and preparation of foot and hand MRI	C2			Interactive Lecture/SDG	2	MCQs	4
59		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences of foot and hand MRI	C2						
60		Parameters & contrast sequences	Explain parameters and contrast sequences of foot and hand MRI	C3						
		Practical Performance	Demonstrate foot and hand imaging procedure through videos		P4		Demo	1	OSPE	**1**
		SOPs Compliance	Adopt how to perform foot and hand MRI procedure			A4	Role Play			
TOPIC: MRI SHOULDER JOINT AND WRIST JOINT										
61	Week-14	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of shoulder joint and wrist joint MRI	C3			Interactive Lecture/SDG	2	MCQs	4
62		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences of shoulder joint and wrist joint MRI	C2						
63		Parameters & contrast sequences	Explain parameters and contrast sequences of shoulder joint and wrist joint MRI	C2						
64		Practical Performance	Demonstrate shoulder joint and wrist joint imaging procedure through videos		P4		Demo	1	OSPE	1
65		SOPs Compliance	Adopt how to perform shoulder joint and wrist joint imaging MRI procedure			A4	Role Play			
TOPIC: MRI HIP JOINT AND KNEE JOINT										
66	Week-15	Indications, contra-indications & preparation	Explain indications, contra-indications and preparation of hip joint and knee joint MRI	C2			Interactive Lecture/SDG	2	MCQs	6
67		Positioning, localiser sequences & planning	Discuss positioning, localiser and sequences of hip joint and knee joint MRI	C3						
68		Parameters & contrast sequences	Explain parameters and contrast sequences of hip joint and knee joint MRI	C2						
69		Practical Performance	Demonstrate hip joint and knee joint imaging through videos		P4		Demo	1	OSPE	**1**
70		SOPs Compliance	Adopt how to perform hip joint and knee joint MRI procedure			A4	Role Play			
TOPIC: MR CONTRAST MEDIA										
71	Week-16	Define	Define MR contrast media	C1				2	MCQs/SEQs	4

72		Contrast sequences & dose administration	Discuss contrast sequences and dose administration	C2			Interactive Lecture/SDG			
73		Indication and contra-indication	Explain indications and contra-indications of contrast	C3						
74		Practical Performance	Demonstrate contrast media through videos/charts/models		P4		Demo	1	OSPE	1
75		SOPs Compliance	Adopt how to handle contrast media of MR			A4	Role Play			

Recommended Books:

1. https://mrimaster.com (follow MRI Master for all MRI procedures and videos)
2. MRI Made Easy (for Beginners) by Govind B. Chavhan, Published by Jaypee Brothers Medical Publishers, New Delhi
3. Handbook of MRI Technique by Catherine Westbrook
4. Rad Tech's Guide to MRI: Basic Physics, Instrumentation, and Quality Control by William H. Faulkner Jr. (Author)

ASSESSMENT BREAKDOWN

S.No	Topics	No of MCQ	No of OSPE / OSCE Stations	Static / Interactive
1	**MR Brain and Pituitary fossa**	6	1	Static
2	**MR Epilepsy & Orbits**	4	1	Static
3	**MR Soft tissue neck**	4	1	Static
4	**MRA and MRV**	6	1	Static and Interactive
5	**C-spine and T-spine**	5	1	Static
6	**L-spine and Whole-spine**	5	1	Static
7	**Cardiac MRI**	4	1	Static and Interactive
8	**Cardiac MRI**			Static and Interactive
9	**MRCP**	6	1	Interactive
10	**MR prostate**	4	0	Static
11	**MRI Female urethra**	4	1	Static
12	**MRI Rectal cancer**	4	1	Static
13	**MRI Foot and Hand**	4	1	Static
14	**MRI Shoulder joint and Wrist joint**	4	1	Static
15	**MRI Hip joint and Knee joint**	6	1	Static
16	**MR contrast media**	4	1	Interactive
Total	**16**	**70**	**14**	**14**

RAD-618 Therapeutic Radiology 3(2+1)

Course Description

This course introduces students to the principles and practices of therapeutic radiology, including the use of ionizing radiation to treat cancer and other diseases. Students will learn about the physics and biology of radiation therapy, treatment planning and delivery, and the clinical applications of various radiation modalities. Topics will include external beam radiation therapy, brachytherapy, stereotactic radiosurgery, and total body irradiation. Emphasis will be placed on the safe and effective delivery of radiation therapy, and the management of treatment-related side effects.

Learning Objectives

Cognitive Domain

By the end of this course, students should be able to

1. Describe the fundamental principles of radiation therapy, including the physics and biology of radiation interactions with tissue.
2. Discuss the clinical applications of various radiation modalities, including external beam radiation therapy, brachytherapy, and stereotactic radiosurgery.
3. Explain the principles of treatment planning, including dose calculation, beam shaping, and optimization techniques.
4. Demonstrate an understanding of radiation therapy procedures, including patient simulation, treatment delivery, and quality assurance.
5. Analyze and interpret radiation therapy treatment plans and dose distributions for various clinical conditions, including cancers and benign diseases.

Psychomotor Domain

By the end of this course, students should be able to

1. Operate radiation therapy equipment, such as linear accelerators and treatment planning systems.
2. Assist in simulating patient treatments using radiation therapy equipment.
3. Prepare and deliver radiation treatment plans according to physician prescriptions.
4. Assist in positioning patients for radiation therapy treatments.
5. Use treatment planning software to generate and verify radiation treatment plans.

Affective Domain

By the end of this course, students should be able to

1. Show respect for patients' autonomy and individuality when discussing treatment options and plans.
2. Adhere to professional standards and protocols for radiation therapy, including safety and quality control.
3. Demonstrate a commitment to ongoing learning and professional development in therapeutic radiology.
4. Collaborate effectively with radiation oncologists, medical physicists, and other healthcare professionals to ensure high-quality patient care.
5. Comply with SOPs of practical & procedure effectively

TABLE OF SPECIFICATIONS

TOS- Therapeutic Radiology 3 (2+1)

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC:INTRODUCTION & HISTORY OF THERAPEUTIC RADIOLOGY										
1	Week-1	Introduction.	Discuss the introduction of radiations.	C2			Interactive Lecture/SDG	2	MCQs	1
2		history	Explain the history of Therapeutic Radiology	C3						
3		Development	Discuss the development of radiation therapy and equipment during the early 20th century.	C2						
4		Establishment	Describe the establishment of radiation therapy as a distinct medical specialty.	C2						1
5		Videos/Charts/Models	Demonstrate the basic concept of radiation therapy.		P4		Demo	1	OSPE	
6		SOP's Compliance	adopt how to care and handle radiation therapy.			A4	Role Play			
TOPIC:APPLIED PHYSICS OF RADIATION ONCOLOGY										
7	Week-2	Radiation interaction	Describe the fundamental principles of radiation interaction with matter.	C2			Interactive Lecture/SDG	2	MCQs	3
8		Photon-Matter Interaction Effects	Discuss photoelectric effect, Compton scattering and pair production.	C2						
9		Radiation Characteristics	Explain the characteristics of various types of radiation used in radiation oncology.	C3						
10		Dosimetry	Discussion over the principles of radiation dosimetry including absorbed dose rate and radiation quality.	C2						1
11		Videos/Charts/Models	Demonstrate different types of dosimeters.		P4		Demo	1	OSPE	
12		SOP's Compliance	Identify independently different modes of dosimeters.			A4	Role Play			
TOPIC:EQUIPMENT OF RADIATION ONCOLOGY										
13	Week-3	Linacs' design	Describe the design and operation of a linear accelerator (linac).	C2			Interactive Lecture/SDG	2	MCQs	6
14		Linacs	Explain components, beam characteristics and clinical applications of linacs.	C3						
15		Principles	Explain principles and functionality of cobalt-60 machines.	C3						

16		Advantages and limitations	Discuss advantages, limitations and clinical uses of cobalt-60.	C2						
17		Characteristics	Explain the characteristics of radiation therapy simulators.	C3						
18		Simulators	Discuss different types of simulators including conventional, CT and PRT-CT simulators.	C2						
19		Dose rate	Describe low-dose-rate and high -dose-rate.	C2						
20		Multi leaf collimators.	Discuss multileaf collimators and its importance in radiation oncology.	C2						
21		Videos/Charts/Models	Video demonstration of linear accelerator.		P4		Demo	1	OSPE	3
22		SOP's Compliance	Comply to SOP's of linear accelerator.			A4	Role Play			
TOPIC: MECHANISM OF RADIATION ACTION,IT'S DOSES & FRACTIONATION										
23	Week-4	Direct and indirect effects of radiation, Role of oxygen, relationship, Principle of fractionation.	Explain the direct and indirect effects of radiation on DNA.	C3			Interactive Lecture/SDG	2	MCQs	4
24		Role of Oxygen	Discuss the role of oxygen in radiation oncology with respect to oxygen enhancement ratio.	C2						
25		Radiation dose response	Describe the concept of radiation dose response relationship.	C2						
26		Fractionation	Explain the principles of radiation fractionation.	C3						
27			Discuss the rationale for fractionation, dose per fraction and the overall treatment time.	C2						
28		Videos/Charts/Models	Demonstrate principles of fractionation through case scenarios.		P4		Demo	1	OSPE	2
29		SOP's Compliance	Comply to SOP's of different methods of dose fractionation.			A4	Role Play			
TOPIC:SIMULATION & TREATMENT PLANNING OF RADIATION TREATMENTS										
30	Week-5	Role of simulation	Describe the role of simulation in radiation therapy, including patient positioning, immobilization and target volume delineation.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
31		CT simulation	Explain the principles of computed tomography simulation.	C3						
32		TPS	Discuss the importance of treatment planning systems (TPS) in radiation oncology.	C2						
33		IMRT	Describe the process of the intensity modulated radiation therapy (IMRT) planning.	C2						
34		IGRT	Explain the role of image guided radiation therapy (IGRT) in treatment planning and delivery.	C3						
35		Videos/Charts/Models	Demonstrate different treatment planning systems through videos and charts.		P4		Demo	1	OSPE	2

36		SOP's Compliance	Adopt how to care and handle different devices of radiation therapy.			A4	Role Play			
TOPIC: EXTERNAL BEAM RADIATION THERAPY										
37	Week-6	EBRT	Describe external beam radiation therapy and it's principle.	C2			Interactive Lecture/SDG	2	MCQs	6
38		3D-CRT.	Explain the principles and applications of 3D-CRT.	C3						
39		IMRT	Explain the process of intensity modulated radiation therapy.	C3						
40		SBRT	Discuss the role of stereotactic body radiation therapy.	C2						
41		TBI	Describe the techniques and applications of total body irradiation (TBI).	C2						
42		Radiotherapy	Explain the principle of portion and electron therapy.	C3						
43		Videos/Charts/Models	Video demonstration of external beam radiation therapy.		P4		Demo	1	OSPE	3
44		SOP's Compliance	Adopt how to care and handle different devices used in external beam radiation therapy.			A4	Role Play			
TOPIC: INTERNAL BEAM RADIATION THERAPY										
45	Week-7	Brachytherapy	Describe internal beam radiation therapy and its principle.	C2			Interactive Lecture/SDG	2	MCQs	6
46		HDR brachytherapy	Describe the process and clinical applications of high-dose-rate (HDR) brachytherapy.	C2						
47		LDR brachytherapy	Describe the process and clinical applications of low-dose-rate (LDR) brachytherapy.	C3						
48		Surface Mold brachytherapy	Discuss the techniques and applications of surface Mold brachytherapy.	C2						
49		IORT	Explain the principles and clinical applications of intraoperative radiation therapy (IORT).	C3						
50		Videos/Charts/Models	Demonstration of brachytherapy through videos and charts.		P4		Demo	1	OSPE	3
51		SOP's Compliance	Adopt how to care and handle different devices used in internal beam radiation therapy.			A4	Role Play			
1TOPIC: SYSTEMIC RADIATION THERAPY										
52	Week-8	Systemic beam radiation therapy	Describe systemic beam radiation therapy and its principle.	C2			Interactive Lecture/SDG	2	MCQs	6
53		Iodine-131	Describe the principles and applications of Iodine-131 in thyroid treatment.	C3						
54		Samarium-153	Explain the process and clinical applications of Samarium-153 for bone metastasis.	C3						
55		Radiolabelling	Discuss the role of radiolabelled monoclonal antibodies in systemic radiation therapy.	C2						
56		Videos/Charts/Models	Demonstration of systemic beam radiation therapy through videos and charts.		P4		Demo	1	OSPE	3
57		SOP's Compliance	Adopt how to care and handle different devices used in systemic beam radiation therapy.			A4	Role Play			

TOPIC: MEDICAL USES OF RADIATION TREATMENTS										
58	Week-9	Radiation therapy in Breast cancer	Describe the role of radiation therapy in the treatment of breast cancer.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
59		Use of SBRT in Lung cancer	Discuss the use of stereotactic body radiation therapy (SBRT) in the treatment of lung cancer.	C2						
60		Brachytherapy in Cervical cancer	Explain the principles and application of brachytherapy in the treatment of cervical cancer	C3						
61		Radiation therapy in Bone metastasis	Describe the use of radiation therapy in the padiative treatment of bone metastasis.	C2						
62		TBI in transplantation	Explain the role of total body irradiation (TBI) in the preparation of patients for the hematopoietic stem cell transplantation.	C3						
63		Videos/Charts/Models	Video demonstration of different types of radiation therapy over different structures.		P4		Demo	1	OSPE	2
64		SOP’s Compliance	Comply with SOPs of different uses of radiation therapy.			A4	Role Play			
TOPIC: RADIATION SAFETY AND PROTECTION										
65	Week-10	TDS principle	Describe the principle of time, distance, and shielding and minimizing radiation exposure.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
66		Role of PPE	Explain the role of (Personal Protective Equipment) PPE in radiation safety.	C3						
67		radiation monitoring and dosimetry	Discus the importance of radiation monitoring and dosimetry in ensuring radiation safety.	C2						
68		Radiation safety	Describe the procedures for handling and disposing of radioactive materials and wastes.	C2						
69		Radiation emergency response	Explain the principles of radiation emergency response planning.	C3						
70		Videos/Charts/Models	Demonstrate radiation safety and protection through different charts and videos.		P4		Demo	1	OSPE	2
71		SOP’s Compliance	Comply with the SOP's of radiation safety and protection.			A4	Role Play			
TOPIC: SIDE EFFECTS OF RADIATION TREATMENTS AND IT'S MANAGEMENT										
72	Week-11& Week-12	Acute and late side effects	Describe the acute and late side effects of radiation therapy.	C2			Interactive Lecture/SDG	4	MCQs/SEQs	10
73		Radiation induced effects	Explain the mechanism and management of radiation induced effects.	C3						
74		Side effects of radiation therapy	Discuss the gastrointestinal side effects of radiation therapy.	C2						
75			Describe the neurological side effects of radiation therapy.	C2						
76			Explain the endocrine side effects of radiation therapy.	C3						
77			Discuss the reproductive side effects of radiation therapy.	C2						
78		Radiation induced side effects	Discuss management of radiation induced side effects related to radiation therapy for brain tumors.	C2						

79		Videos/Charts/Models	Video demonstration of different types of radiation therapy's side effects.		P4		Demo	2	OSPE	5
80		SOP's Compliance	Adopt how to care and handle different types of radiation treatments and its management.			A4	Role Play			
TOPIC: RADIATION THERAPY FOR BRAIN TUMORS										
81	Week13	Introduction to brain tumors	Describe brain tumors and radiation therapy.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
82		Types of radiation therapy	Discuss types of radiation therapy for brain tumors.	C2						
83		Treatment planning	Explain treatment planning and delivery for brain tumors.	C3						
84		Clinical applications	Describe clinical application of radiation therapy for brain tumors.	C2						
85		Side effects management	Discuss management of radiation induced side effects related to radiation therapy for brain tumors.	C2						
86		Videos/Charts/Models	Demonstrate the procedure of radiation therapy for brain tumors.		P4		Demo	1	OSPE	3
87		SOP's Compliance	Adopt how to care and handle the procedure of brain tumor therapy.			A4	Role Play			
TOPIC: RADIATION THERAPY FOR BREAST TUMORS										
88	Week-14	Introduction to Breast tumors	Describe breast tumors and radiation therapy.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
89		Types of radiation therapy	Discuss types of radiation therapy for breast tumors.	C2						
90		Treatment planning	Explain treatment planning and delivery for breast tumors.	C3						
91		Clinical applications	Describe clinical application of radiation therapy for breast tumors.	C2						
92		Side effects management	Discuss management of radiation induced side effects related to radiation therapy for breast tumors.	C2						
93		Videos/Charts/Models	Demonstrate the procedure of radiation therapy for breast tumors.		P4		Demo	1	OSPE	2
94		SOP's Compliance	Adopt how to care and handle the procedure of breast tumor therapy.			A4	Role Play			
TOPIC: RADIATION THERAPY FOR LUNG TUMORS										
95	Week-15	Introduction to Lung tumors	Describe lung tumors and radiation therapy.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
96		Types of radiation therapy	Discuss types of radiation therapy for lung tumors.	C2						
97		Treatment planning	Explain treatment planning and delivery for lung tumors.	C3						
98		Clinical applications	Describe clinical application of radiation therapy for lung tumors.	C2						

99		Side effects management	Discuss management of radiation induced side effects related to radiation therapy for lung tumors.	C2						
100		Videos/Charts/Models	Demonstrate the procedure of radiation therapy for lung tumors.		P4		Demo	1	OSPE	2
101		SOP's Compliance	Adopt how to care and handle the procedure of lung tumor therapy.			A4	Role Play			
TOPIC: RADIATION THERAPY FOR STOMACH TUMORS										
102	Week-16	Introduction to Stomach tumors	Describe stomach tumors and radiation therapy.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	4
103		Types of radiation therapy	Discuss types of radiation therapy for stomach tumors.	C2						
104		Treatment planning	Explain treatment planning and delivery for stomach tumors.	C3						
105		Clinical applications	Describe clinical application of radiation therapy for stomach tumors.	C2						
106		Side effects management	Discuss management of radiation induced side effects related to radiation therapy for stomach tumors.	C2						
107		Videos/Charts/Models	Demonstrate the procedure of radiation therapy for stomach tumors.		P4		Demo	1	OSPE	2
108		SOP's Compliance	Adopt how to care and handle the procedure of stomach tumor therapy.			A4	Role Play			

Recommended Books:

1. Technical Basis of Radiation Therapy: Practical Clinical Applications (Medical Radiology/Radiation Oncology Seymour H. Levitt, James A. Purdy
2. Therapeutic radiology By Carl M. Mansfield Medical Examination Pub. Co., 1983
3.

ASSESSMENT BREAKDOWN

S.No	Topics	No of MCQ	No of OSPE / OSCE Stations	Static / Interactive
1	**Introduction and history of therapeutic Radiology**	1	1	**Static**
2	**Applied physics of radiation oncology**	3	1	**Static and Interactive**
3	**Equipment of radiation oncology**	6	1	**Static**
4	**Mechanism of radiation action, it's dose and fractionation**	4	1	**Static**
5	**Simulation and treatment planning of radiation treatments**	4	1	**Static**
6	**External beam radiation therapy**	6	1	**Static and Interactive**
7	**Internal beam radiation therapy**	6	1	**Static**
8	**Systemic radiation therapy**	6	1	**Static and Interactive**

9	**Medical uses of radiation treatments**	4	1	**Static**
10	**Radiation safety and protection**	4	1	**Static**
11	**Side effects of radiation treatments and it's management**	5	1	**Interactive**
12	**Side effects of radiation treatments and it's management**	5	1	**Static**
13	**Radiation Therapy for Brain Tumors**	4	1	**Static and Interactive**
14	**Radiation Therapy for Breast Tumors**	4	1	**Static and Interactive**
15	**Radiation Therapy for Lung Tumors**	4	1	**Static and Interactive**
16	**Radiation Therapy for Stomach Tumors**	4	1	**Static and Interactive**
Total		**70**	**14**	**14**

RAD-621 Nuclear Medicine 3(2+1)

Course Description

This course introduces students to the principles and practices of nuclear medicine, including the use of radioactive substances for diagnostic and therapeutic purposes. Students will learn about the physics and instrumentation of nuclear medicine, radiopharmaceuticals, and the clinical applications of various nuclear medicine procedures. Topics will include planar imaging, single photon emission computed tomography (SPECT), positron emission tomography (PET), and radionuclide therapy. Emphasis will be placed on the safe handling and administration of radioactive materials, image acquisition and interpretation, and the integration of nuclear medicine findings with other diagnostic modalities.

Learning Objectives

Cognitive Domain

By the end of this course, students should be able to

1. Describe the fundamental principles of nuclear medicine, including the physics of radioactive decay and the characteristics of radiopharmaceuticals.
2. Discuss the clinical applications of various nuclear medicine procedures; including planar imaging, single photon emission computed tomography (SPECT), and positron emission tomography (PET).
3. Explain the principles of radiopharmaceutical production, quality control, and administration.
4. Demonstrate an understanding of nuclear medicine imaging procedures, including patient preparation, data acquisition, and image processing.
5. Analyze and interpret nuclear medicine images for various clinical conditions, including cancers, cardiovascular diseases, and neurological disorders.

Psychomotor Domain

By the end of this course, students should be able to

1. Prepare and administer radiopharmaceuticals for various nuclear medicine procedures.
2. Operate nuclear medicine imaging equipment, such as gamma cameras and PET scanners.
3. Perform quality control tests on nuclear medicine equipment and radiopharmaceuticals.
4. Assist in positioning patients for nuclear medicine imaging procedures.
5. Participate in the preparation of radiopharmaceuticals and other materials for nuclear medicine procedures.

Affective Domain

By the end of this course, students should be able to

1. Demonstrate respect for patients' safety and well-being when administering radiopharmaceuticals and performing nuclear medicine procedures.
2. Adhere to professional standards and protocols for nuclear medicine, including radiation safety and quality control.
3. Demonstrate a commitment to ongoing learning and professional development in nuclear medicine.
4. Collaborate effectively with nuclear medicine physicians, technologists, and other healthcare professionals to ensure high-quality patient care.
5. Comply with SOPs of practical & procedure effectively

TABLE OF SPECIFICATION

TOS- Nuclear Medicine (2+1)

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC: BASIC REVIEW OF ATOMIC AND NUCLEAR STRUCTURE										
1	Week-1	Atomic and Nuclear structure	Describe the arrangements of Electron, Proton and Neutrons within an atom.	C2			Interactive Lecture/SDG	2	MCQs	2
2			Discuss how the arrangements of these structures affect the overall stability of a Nucleus.	C2						
3		Binding Energy	Explain the concept of binding energy and its relationship with stability.	C3						
4		Excitation Energy	Describe the process of nuclear excitation and de-excitation.	C2						
5		Nuclear fusion and nuclear fission reaction.	Discuss the difference between Nuclear Fusion and Nuclear Fission reaction.	C3						
6		Videos/Charts/Models	Video demonstration of the basic structure of an atom.		P4		Demo	1	OSPE	1
7		SOP's Compliance	Independently identify different parts of an atom.			A4	Role Play			
TOPIC: ARTIFICIAL AND NATURAL RADIOACTIVITY										
8	Week-2	Artificial Radioactivity,	Describe the process of Artificial radioactivity.	C2			Interactive Lecture/SDG	2	MCQs	3
9		Natural radioactivity	Discuss Natural radioactivity.	C2						
10			Explain the differences between Artificial and Natural radioactivity.	C2						
11		Discovery of natural radioactivity	Discuss the discovery of Natural radioactivity by Henri Becquerel.	C2						
12		Concept of radioactive equilibrium	Explain the concept of Radioactive Equilibrium.	C3						
13		Videos/Charts/Models	Demonstration of radioactivity through videos.		P4		Demo	1	OSPE	1
14		SOP's Compliance	comply to the SOP's of radioactivity.			A4	Role Play			

TOPIC: NUCLIDE, CLASSIFICATION OF RADIONUCLIDE AND STABILITY										
15	Week-3	Nuclide	Describe Nuclide and its characteristics.	C2			Interactive Lecture/SDG	2	MCQs	4
16		Classification	Discuss the classification of Nuclides into different categories.	C2						
17		Radionuclide,	Explain the concept of Radionuclides.	C3						
18		Radioactive nuclides and stability	Describe the factors affecting the stability of Radionuclides.	C2						
19		Videos/Charts/Models	Demonstration of different radionuclide through charts.		P4		Demo	1	OSPE	2
20		SOP's Compliance	Comply to the SOPs of different factors affecting stability of radionuclide.			A4	Role Play			
TOPIC: ALPHA, BETA AND GAMMA DECAY										
21	Week-4	Alpha decay	Describe the process of Alpha decay.	C2			Interactive Lecture/SDG	2	MCQs	4
22		Beta decay	Explain Beta decay and differences between Beta (-) and Beta (+) decay.	C3						
23		Gamma decay	Discuss the process of Gamma decay.	C2						
24		Properties of alpha, beta, and Gamma decay	Explain the properties of Alpha, Beta and Gamma decays.	C3						
25		Videos/Charts/Models	Video demonstration of different types of decays.		P4		Demo	1	OSPE	2
26		SOP's Compliance	Independently identify different processes of decay.			A4	Role Play			
TOPIC: RADIOACTIVITY AND IT'S UNITS										
27	Week-5	Radioactivity	Discuss Radioactivity.	C3			Interactive Lecture/SDG	2	MCQs/SEQs	3
28			Explain the process of radioactivity.	C2						
29			Describe the units used to measure radioactivity.	C3						
30		Dosage,	Explain the concept of radiation dosage and factors that affect it.	C2						
31		Decay and Half life.	Discuss the process of Radioactive decay.	C2						
32			Describe the concept of Half life.	C3						
33		Videos/Charts/Models	Video demonstration of radiation detectors and dosage.		P4		Demo	1	OSPE	1
34		SOP's Compliance	Comply to the SOP's of radioactivity.			A4	Role Play			
TOPIC: PRODUCTION OF RADIONUCLIDE AND ITS METHOD										
35	Week-6	Process of nuclear reaction, nuclear reactors	Describe the process of nuclear reactions.	C1			Interactive Lecture/SDG	2	MCQs	4
36		Production of radionuclide	Explain the method of Radionuclide production through nuclear reactors.	C2						

37		Cyclotrons	Discuss the production of Radionuclide using particle accelerator (Cyclotrons)	C3						
38		Nuclear Fusion and Fission	Explain the method of Radionuclide production using Nuclear Fusion and Fission reactions.	C3						
39		Videos/Charts/Models	Video demonstration of various methods of radionuclides production.		P4		Demo	1	OSPE	2
40		SOP's Compliance	Comply to the SOP's of different types of radionuclide Production.			A4	Role Play			
TOPIC: GENERATORS AND RADIONUCLIDE PRODUCTION										
41	Week-7	Radionuclide generator, Components	Describe radionuclide generator and its components.	C1			Interactive Lecture/SDG	2	MCQs	4
42		Working principle,	Explain the working principle of Radionuclide generator.	C3						
43		Types	Discuss different types of nuclear generators	C3						
44		Advantages and limitations	Explain the advantages and limitations of Radionuclide generators.	C3						
45		Videos/Charts/Models	Video demonstration of different components of radionuclide generator.		P4		Demo	1	OSPE	2
46		SOP's Compliance	Comply to the SOPs of the working principle of the radionuclide generator.			A4	Role Play			
TOPIC: RADIOPHARMACEUTICALS (RPH.) AND IT'S SELECTION CRITERIA										
47	Week-8	Radiopharmaceuticals, its selection.	Discuss radiopharmaceuticals.	C2			Interactive Lecture/SDG	2	MCQs	3
48			Discuss the criteria for selecting radiopharmaceuticals for diagnostic and therapeutic applications.	C3						
49		Selection of chemicals	Describe the process of selecting suitable chemicals for radiopharmaceutical developments.	C2						
50		Development	Explain the role of Radionuclide properties in the development of radiopharmaceuticals.	C2						
51			Describe the stages involved in the development of Radiopharmaceuticals from preclinical to clinical trials.	C3						
52		Quality control	Discuss the quality control measure for the development of radiopharmaceuticals.	C2						
53		Videos/Charts/Models	Demonstrate formation of radiopharmaceuticals through videos.		P4		Demo	1	OSPE	1
54		SOP's Compliance	Adopt how to care and handle radiopharmaceuticals.			A4	Role Play			
TOPIC: LABELING OF RADIOPHARMACEUTICALS WITH TECHNETIUM IODINE AND OTHERS										
55	Week-9	Technetium labelled radiopharmaceuticals	Describe the method of labelling radiopharmaceuticals with technetium-99.	C1			Interactive Lecture/SDG	2	MCQs/SEQs	8

56		Iodine labelled radiopharmaceuticals	Explain the principles of labelling radiopharmaceuticals with iodine-131 and 123.	C3						
57		Quality control	Describe the quality control measures for labelled radiopharmaceuticals.	C3						
58			Explain the factors influencing the stability of labelled radiopharmaceuticals.	C2						
59			Discuss the challenges and limitations of labelling radiopharmaceuticals.	C2						
60		Videos/Charts/Models	Demonstrate labeling of radiopharmaceuticals through videos and charts.		P4		Demo	1	OSPE	4
61		SOP's Compliance	Adopt how to label radiopharmaceuticals.			A4	Role Play			
TOPIC: THERAPEUTIC USES AND MISADMINISTRATION OF RADIOPHARMACEUTICALS										
62	Week-10	Therapeutic use of radiopharmaceuticals, it's misadministration,	Describe the therapeutic uses of Radiopharmaceuticals in the treatment of cancer.	C2			Interactive Lecture/SDG	2	MCQs/SEQs	3
63			Explain the role of Radiopharmaceuticals in palliative care.	C2						
64			Discuss the potential consequences of misadministration of Radiopharmaceuticals.	C3						
65		Iodine labelled radiopharmaceuticals	Describes the measures for preventing misadministration of rad//.	C2						
66			Explain the management for responding to incidence of misadministration of Radiopharmaceuticals.	C2						
67		Videos/Charts/Models	Video demonstration of adverse effects of misadministration of radiopharmaceuticals.		P4		Demo	1	OSPE	1
68		SOP's Compliance	Adopt how to manage adverse effects of misadministration of radiopharmaceuticals.			A4	Role Play			
TOPIC: RADIATION DOSIMETERS AND ITS WORKING PRINCIPLE										
69	Week-11& Week-12	Radiation detectors	Discuss radiation dosimetry	C2			Interactive Lecture/SDG	4	MCQs/SEQs	10
70		Properties	Describe the basic properties of radiation detection.	C3						
71		Types	Discuss different types of radiation detectors.	C1						
72		Gas filled detectors	Discuss the design and working principle of gas filled detectors.	C3						
73		Dose calibrator	Discuss the design and working principle of dose calibrators.	C2						
74		Scintillation camera	Discuss the design and working principle of Scintillation camera.	C2						
75			Explain the principle of image formation and reconstruction in Scintillation camera.	C2						

76		Videos/Charts/Models	Video demonstration of different types of radiation dosimeters.		P4		Demo	2	OSPE	5
77		SOP's Compliance	Independently identify different parts of dosimeters.			A4	Role Play			
TOPIC: SINGLE PHOTON EMISSION TOMOGRAPHY (SPECT)										
78	Week-13	SPECT	Discuss Single Photon Emission Tomography.	C1			Interactive Lecture/SDG	2	MCQs/SEQs	7
79		Working principle	Describe the working principle of SPECT.	C3						
80		Clinical applications	Describe the clinical application of SPECT.	C3						
81		Types	Discuss the types of SPECT system.	C2						
82		Mechanism	Explain the mechanism of SPECT imaging.	C2						
83		Advantages and limitations	Explain the advantages and limitations of SPECT compared to other imaging modalities.	C2						
84		Videos/Charts/Models	Video demonstration of the working principle of SPECT.		P4		Demo	1	OSPE	3
85		SOP's Compliance	Comply to the SOP's of SPECT.			A4	Role Play			
TOPIC: POSITRON EMISSION TOMOGRAPHY (PET)										
86	Week-14	PET	Discuss Positron Emission Tomography (PET).	C2			Interactive Lecture/SDG	2	MCQs/SEQs	7
87		Working principle	Describe the working principle of PET.	C3						
88		Mechanism	Explain the mechanism of PET imaging.	C2						
89		Types	Discuss the types of PET system.	C2						
90		Clinical applications	Describe the clinical applications of PET.	C2						
91		Advantages and limitations	Explain the advantages and limitations of PET compared to other imaging modalities.	C3						
92		Videos/Charts/Models	Video demonstration of the working principle of PET.		P4		Demo	1	OSPE	3
93		SOP's Compliance	Comply to the SOP's of PET.			A4	Role Play			
TOPIC: RADIATION PROTECTION										
94	Week-15	Radiation protection	Describe the principles of radiation protection.	C3			Interactive Lecture/SDG	2	MCQs/SEQs	4
95		Waste disposal	Explain the methods of waste disposal for radioactive materials.	C2						
96		Shielding and transportation of Radionuclides	Discuss the design and construction of shielding for radiation protection.	C1						
97			Describe the regulations and guidelines for the transportation of radionuclides.	C2						
98		Videos/Charts/Models	Demonstration of radiation protection protocols through charts and models.		P4		Demo	1	OSPE	2
99		SOP's Compliance	Comply to the SOP's of radiation protection.			A4	Role Play			
TOPIC: BIOSAFETY RELATED TO RADIOPHARMACEUTICALS										

100	Week-16	Health physics safety in medical facility	Describe the principles of health physics	C1			Interactive Lecture/SDG	2	MCQs/SEQs	4
101		Methods of safe handling of radiopharmaceuticals	Explain the methods of safe handling of radiopharmaceuticals.	C1						
102		Rules and regulations	Discuss the rules and regulations governing the handling and use of radiopharmaceuticals.	C3						
103		Guidelines for radiation safety in medical facility	Explain the guidelines for radiation safety in medical facility.	C2						
104		Videos/Charts/Models	Demonstration of safe handling of radiopharmaceuticals through videos.		P4		Demo	1	OSPE	2
105		SOP's Compliance	Adopt how to care and handle radiopharmaceuticals transportation.			A4	Role Play			

Recommended Books:

1. Nuclear Medicine Physics, The basics, by Ramesh Chandra, 6th edition
2. Nuclear Medicine Technology ad techniques by Donald R. Bernier, 4th edition

ASSESSMENT BREAKDOWN

S.No	Topics	No of MCQ	No of OSPE / OSCE Stations	Static / Interactive
1	**Basic review of atomic and nuclear structure**	2	1	**Static**
2	**Artificial and Natural Radioactivity**	3	1	**Static and Interactive**
3	**Nuclide, Classification of Radionuclide and stability**	4	1	**Static**
4	**Alpha, Beta and Gamma decay**	4	1	**Static**
5	**Radioactivity and it's units**	3	1	**Static**
6	**Production of Radionuclide and its method**	4	1	**Static and Interactive**
7	**Generators and radionuclide Production**	4	1	**Static**
8	**Radiopharmaceuticals (RPh) and it's selection criteria**	3	1	**Static and Interactive**
9	**Labeling of radiopharmaceuticals with technetium Iodine and others**	8	1	**Static**
10	**Therapeutic uses and misadministration of Radiopharmaceuticals**	3	1	**Static**
11	**Radiation dosimeters and its working principle**	5	1	**Interactive**
12	**Radiation dosimeters and its working principle**	5	1	**Static**

13	**Single Photon Emission Tomography (SPECT)**	7	1	**Interactive**
14	**Positron Emission Tomography (PET)**	7	1	**Static and Interactive**
15	**Radiation protection**	4	1	**Static**
16	**Biosafety related to radiopharmaceuticals**	4	1	**Static and Interactive**
Total		**70**	**14**	**14**

RAD-626 Clinical Pathology And Radiological Presentation-I 2(1+1)

Course Description

This course provides an in-depth study of the clinical pathology and radiological presentation of various diseases and conditions. Students will learn to correlate radiological findings with clinical symptoms and laboratory results, and develop skills in interpreting radiological images and reports. The course will cover a range of topics, including basic introduction to various radiological imaging modalities, chest, cardiac, female genital and urinary tract. Emphasis will be placed on the integration of clinical and radiological information to facilitate accurate diagnosis and effective patient management.

Learning Objectives

Cognitive Domain

By the end of this course students should be able to

1. Describe the correlation between clinical pathology and radiological findings in various diseases and conditions.
2. Discuss the radiological presentation of common pathological conditions, including inflammatory, infectious, and neoplastic diseases.
3. Explain the underlying pathological processes that contribute to radiological findings in various body systems.
4. Demonstrate an understanding of the role of imaging modalities (e.g. CT, MRI, US) in diagnosing and monitoring disease progression.
5. Analyze and interpret radiological images in conjunction with clinical pathology results to develop a comprehensive understanding of disease processes and diagnosis.

Psychomotor Domain

By the end of this course students should be able to

1. Perform a systematic analysis of radiological images to identify normal and abnormal findings.
2. Conduct a thorough clinical examination to gather relevant information for radiological interpretation.
3. Develop and present a comprehensive radiological report, integrating clinical pathology results and imaging findings.
4. Identify and label normal anatomical structures on radiological images.
5. Assist in preparing radiological images for presentation and interpretation.

Affective Domain

By the end of this course students should be able to

1. Maintain a critical and reflective approach to clinical pathology and radiological interpretation, recognizing the limitations and potential biases of diagnostic tests.
2. Demonstrate a professional and respectful attitude when interpreting and presenting clinical pathology and radiological findings.
3. Adhere to professional standards and protocols for clinical pathology and radiological reporting, including accuracy and timeliness.
4. Collaborate effectively with clinicians, radiologists, and other healthcare professionals to ensure accurate and timely diagnosis and treatment.

TABLE OF SPECIFICATION

TOS-Clinical Pathology and Radiological Presentation-I 2(1+1)

S.No	Weeks	Contents	Learning Outcome	Domain			MIT's	Time/Hours	Assessment	No of Items
				C	P	A				
TOPIC: TECHNICAL CONSIDERATION IN CXR & CT										
1	Week-1	Conventional radiography	Describe the role of the imaging department in diagnostic imaging.	C2			Interactive Lecture/SDG	1	MCQs	3
2		Working principle	Describe the principles of conventional radiography.	C2						
3		Advantages and limitations	Explain the advantages and limitations of conventional radiography	C3						
4		CT scan	Explain the principles of CT imaging.	C3						
5		Clinical applications	Discuss the clinical applications of CT imaging.	C2						
6		Types of contrast agents	Describe the different types of contrast agents used in conventional radiography and CT.	C2						
7		Ultrasound working principle	Describe the principles and clinical applications of ultrasound imaging.	C2						
8		Advantages and limitations	Explain the advantages and limitations of ultrasound imaging.	C3						
9		Videos/Charts/Models	Video demonstration of 3D reconstruction and volume rendering in CT		P4		Demo	1	OSPE	1
10		SOP's Compliance	Adopt how to care and handle imaging modalities			A4	Role Play			
TOPIC: TECHNICAL CONSIDERATION IN MRI & RADIONUCLIDE IMAGING										
11	Week-2	Radionuclide imaging	Explain the basic principle and clinical applications of radionuclide imaging.	C2			Interactive Lecture/SDG	1	MCQs	2
12			Discuss different types of radionuclides used in imaging procedures.	C2						
13		MRI	Describe the principles of MRI.	C2						
14			Discuss the indications and contraindications for MRI procedures.	C2						
15		PACS	Describe different components of PACS.	C2						
16		Significance of PACS	Explain the importance of image storage and retrieval in PACS.	C3						

17		Videos/Charts/Models	Video Demonstration of image acquisition and processing techniques on MRI scanner		P4		Demo	1	OSPE	1
18		SOP's Compliance	Adopt how to care and handle radiopharmaceuticals			A4	Role Play			
TOPIC: PLEURAL EFFUSION & PLEURAL TUMORS										
19	Week-3	Imaging techniques	Describe the imaging techniques used for thoracic diseases	C2			Interactive Lecture/SDG	1	MCQs	5
20			Describe chest diseases with a normal CXR in detail	C2						
21		Chest signs	Explain abnormal chest signs.	C3						
22		Pleura effusion	Describe pleural effusion and its clinical presentation	C2						
23			Explain the role of imaging modalities in characterizing pleura effusion	C3						
24		Pleural tumors	Describe pleural tumors and pleural calcification	C2						
25		Videos/Charts/Models	Demonstrate characteristics appearance of pleural effusion using radiographs		P4		Demo	1	OSPE	2
26		SOP's Compliance	Adopt how to care and handle radiographs			A4	Role Play			
TOPIC: MEDIASTINAL MASSES										
27	Week-4	Mediastinum	Describe the structures visible on CT and MRI of normal mediastinum	C2			Interactive Lecture/SDG	1	MCQs	6
28		Types	Describe different types of mediastinal masses	C2						
29		Image findings	Discuss the imaging findings of mediastinal masses on plain radiography and CT scan	C2						
30		Aortic aneurysm	Describe aortic aneurysm and its imaging findings.	C2						
31		Hilar enlargement	Define hilar enlargement	C1						
32		Causes	Explain causes and imaging findings of hilar enlargement	C3						
33		Videos/Charts/Models	Demonstrate characterization of mediastinal masses on CT images		P4		Demo	1	OSPE	3
34		SOP's Compliance	Adopt how to position patients for CT chest Imaging.			A4	Role Play			
TOPIC: PNEUMONIA & PNEUMOTHORAX										
35	Week-5	Bacterial pneumonia	Define bacterial pneumonia	C1			Interactive Lecture/SDG	1	MCQs/SEQs	9
36			Describe common causes of bacterial pneumonia and their imaging findings	C2						
37		Viral pneumonia	Describe viral and mycoplasma pneumonia	C2						
38		Lung abscess	Explain lung abscess and its causes	C3						

39		Pneumothorax	Describe pneumothorax and its pathophysiology	C2						
40			Explain the radiographic appearance of pneumothorax.	C3						
41		Videos/Charts/Models	Demonstrate series of chest radiographs for characterization of pneumonia		P4		Demo	1	OSPE	4
42		SOP's Compliance	Comply to the SOPS of CXR positioning.			A4	Role Play			
TOPIC: TUBERCULOSIS										
43	Week-6	Pulmonary tuberculosis	Define pulmonary tuberculosis (TB)	C1			Interactive Lecture/SDG	1	MCQs/SEQs	5
44		Pathogenesis	Explain the pathogenesis of pulmonary TB	C3						
45		Modes of transmission	Describe the modes of transmission of pulmonary TB.	C2						
46		Clinical forms	Explain the different clinical forms of pulmonary TB.	C3						
47		Imaging modality	Describe the role of chest radiographs and computed tomography (CT) scans in diagnosing pulmonary TB.	C2						
48		Videos/Charts/Models	Demonstration of different stages of TB using videos or charts		P4		Demo	1	OSPE	2
49		SOP's Compliance	Comply to the SOPS of CT chest procedure.			A4	Role Play			
TOPIC: AIRWAY DISEASES										
50	Week-7	Asthma, bronchiolitis, COPD, Emphysema bronchiectasis	Describe the diseases of airways (asthma, bronchiolitis, COPD, Emphysema bronchiectasis)	C2			Interactive Lecture/SDG	1	MCQs	5
51		Clinical features	Describe the Clinical features of airways diseases	C2						
52		Radiographic findings	Discuss the radiographic findings of airway diseases.	C2						
53		Videos/Charts/Models	Demonstrate different appearance of emphysema through Radiographs and videos		P4		Demo	1	OSPE	2
54		SOP's Compliance	Adopt how to care and handle in cooperative patients.			A4	Role Play			
TOPIC: CARDIAC IMAGING TECHNIQUE & PULMONARY HYPERTENSION										
53	Week-8	Imaging technique	Describe the imaging techniques used cardiac diseases.	C2			Interactive Lecture/SDG	1	MCQs	2
54		Pulmonary vasculature	Describe the radiographic assessment of pulmonary vasculature	C2						
55		Pulmonary hypertension	Define pulmonary arterial hypertension	C1						
56		Videos/Charts/Models	Video demonstration of ECG gating used in cardiac CT		P4		Demo	1	OSPE	1

57		SOP's Compliance	Adopt how to care and handle monitoring devices used in CT department			A4	Role Play			
TOPIC: PULMONARY EDEMA										
58	Week-9	Pulmonary edema	Describe pulmonary edema.	C2			Interactive Lecture/SDG	1	MCQs/SEQs	3
59		Imaging modalities	Explain the role of imaging modalities in diagnosing pulmonary edema	C3						
60		Ischemic heart disease	Describe ischemic heart disease and its clinical presentation	C2						
61		Videos/Charts/Models	Demonstrate pulmonary edema using chest radiographs		P4		Demo		OSPE	1
62		SOP's Compliance	Adopt how to position patients for CT Cardiac Imaging.			A4	Role Play			
TOPIC: HEART FAILURE										
63	Week-10	Heart failure	Define heart failure and its common causes	C2			Interactive Lecture/SDG	1	MCQs/SEQs	5
64			Explain the diagnostic findings of cardiac ultrasound in heart failure	C3						
65		Pericardial effusion	Describe pericardial effusion.	C2						
66		Videos/Charts/Models	Demonstration of different cardiac disorders thought radiographs		P4		Demo	1	OSPE	2
67		SOP's Compliance	Adopt how to care and handle radiographs showing cardiac disorders.			A4	Role Play			
TOPIC: VALVULAR HEART DISEASE										
68	Week-11	Valvular heart diseases	Define valvular heart diseases	C1			Interactive Lecture/SDG	1	MCQs/SEQs	5
69		Types	Describe different types of valvular heart diseases	C2						
70		Clinical presentation	Discuss the clinical presentation of valvular heart diseases	C2						
71		Imaging modalities	Describe the role of imaging modalities in diagnosing valvular heart diseases	C2						
72		Videos/Charts/Models	Video demonstration of different imaging findings in case of valvular heart diseases.		P4		Demo	1	OSPE	2
73		SOP's Compliance	Adopt how to care and handle ultrasound probes used for evaluation of valvular diseases			A4	Role Play			
TOPIC: URINARY TRACT DISORDERS										
74	Week-12 & Week-13	Imaging techniques,	Describe the basic and special imaging techniques used for Urinary tract	C2			Interactive Lecture/SDG	2	MCQs/SEQs	5
75		Urinary tract disorders	Explain urinary tract disorders and the imaging techniques used for it.	C3						
76		Urinary tract obstruction	Describe urinary tract obstruction	C2						

77		Causes	Explain the causes and imaging findings of urinary tract obstruction	C3						
78		Renal parenchymal diseases	Describe renal parenchymal masses	C2						
79		Videos/Charts/Models	Video demonstration of different imaging findings in case of urinary tract infection.		P4		Demo	2	OSPE	2
80		SOP's Compliance	Comply to the SOPS of urinary tract positioning.			A4	Role Play			
TOPIC: CONGENITAL ABNORMALITIES OF URINARY TRACT										
81	Week-14	Renal failure	Describe renal failure and it's imaging findings	C2			Interactive Lecture/SDG	1	MCQs/SEQs	5
82		Congenital abnormalities	Explain congenital abnormalities of urinary tract	C3						
83		Bladder outflow obstruction	Describe the pathophysiology of bladder outflow obstruction	C2						
84		Videos/Charts/Models	Video Demonstration of CT urography procedure in detecting obstruction		P4		Demo	1	OSPE	2
85		SOP's Compliance	Comply to the SOP's of CT urography			A4	Role Play			
TOPIC: FEMALE GENITAL TRACT DISORDERS										
86	Week-15	Imaging techniques, ovarian masses, PID	Describe the normal appearance of female genital tract on imaging modalities	C2			Interactive Lecture/SDG	1	MCQs/SEQs	4
87		Ovarian & pelvic masses	Describe pelvic and ovarian masses	C2						
88		PID	Explain the pathophysiology and clinical presentation of PID	C3						
89		Endometriosis	Describe endometriosis and its sonographic appearance.	C2						
90		Videos/Charts/Models	Video demonstration of TVS procedure for evaluation of ovarian masses		P4		Demo	1	OSPE	2
91		SOP's Compliance	Comply to the SOP's of female genital tract procedures.			A4	Role Play			
TOPIC: IMAGING TECHNIQUE OF FEMALE GENITAL TRACT										
92	Week-16	IUCD	Describe IUCD and their detection on Ultrasound	C2			Interactive Lecture/SDG	1	MCQs/SEQs	6
93		Hysterosalpingography	Describe Hysterosalpingography procedure.	C2						
94		Obstetrical ultrasound	Describe the role of obstetrical ultrasound in pregnancy	C2						
95		Videos/Charts/Models	Video demonstration of HSG procedure.		P4		Demo	1	OSPE	3
96		SOP's Compliance	Adopt how to handle contrast agent used in HSG			A4	Role Play			

Recommended Books:
1. Diagnostic Imagine by Peter Armstrong, Martin Wastie, Andria Rockall, 11th Edition
2. Essential Radiology (Clinical Presentation. Pathophysiology. Imaging) Richard B. Gunderman 3rd Edition
3. Radiology Secrets by E.Scott Pretorious, 2nd Edition

ASSESSMENT BREAKDOWN				
S.No	**Topics**	**No of MCQ**	**No of OSPE / OSCE Stations**	**Static / Interactive**
1	**Technical Consideration in CXR & CT**	3	1	**Static**
2	**Technical Consideration in MRI & Radionuclide imaging**	2	1	**Static and Interactive**
3	**Pleural effusion & pleural tumors**	5	1	**Static**
4	**Mediastinal masses**	6	1	**Static**
5	**Pneumonia & pneumothorax**	9	1	**Static**
6	**Tuberculosis**	5	1	**Static and Interactive**
7	**Airway diseases**	5	1	**Static**
8	**Cardiac imaging technique & pulmonary hypertension**	2	1	**Static and Interactive**
9	**Pulmonary edema**	3	1	**Static**
10	**Heart failure**	5	1	**Static**
11	**Valvular heart disease**	5	1	**Interactive**
12	**Urinary Tract disorders**	3	1	**Static**
13	**Urinary Tract disorders**	2	1	**Interactive**
14	**Congenital abnormalities of urinary tract**	5	1	**Static**
15	**Female genital tract disorders**	4	1	**Static**
16	**Imaging technique of female genital tract**	6	1	**Static**
Total		**70**	**14**	**14**

THE END