TEERTHANKER MAHAVEER UNIVERSITY

(Established under Govt. of U. P. Act No. 30, 2008)

Delhi Road, Moradabad (U.P.)

PhD PROGRAMME

SYLLABUS FOR DISCIPLINE-SPECIFIC COURSE
RADIOLOGICAL IMAGING TECHNIQUES

Course Code: PDS240112	RADIOLOGICAL IMAGING TECHNIQUES	L	T	P	C
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Objective:	The PhD program in Radiological Imaging Techniques aims to advance expertise in imaging technologies by fostering innovation, interdisciplinary collaboration, and research excellence. It equips scholars with in-depth knowledge of imaging modalities like MRI, CT, PET, and ultrasound, alongside skills in quantitative analysis, image processing, and machine learning. Graduates are prepared to develop novel imaging techniques, address clinical and research challenges, and lead advancements in diagnostic, therapeutic, and interventional radiology. The program emphasizes ethical research, leadership, and lifelong learning to drive meaningful contributions to academia, industry, and healthcare.				
Course Outcomes:					
CO 1:	Understanding the principles of radiological imaging physics including modalities such as MRI, CT, ultrasound, and nuclear medicine				
CO 2:	Applying cutting-edge imaging techniques to diagnose and assess pathological conditions, focusing on integrating radiological findings with clinical practice.				
CO 3:	Analyzing the imaging modalities' benefits, drawbacks, and developments critically while deciphering intricate radiological data to aid in clinical judgment and research.				
CO 4:	Evaluating the safety, ethical, and legal ramifications of radiological imaging procedures and suggesting ways to enhance imaging protocols and patient-centered treatment.				
CO 5:	Designing cutting-edge research initiatives that combine computational tools and radiological imaging technology to improve our understanding of medical diagnosis and treatment planning.				
Course Content:					
Unit 1:	**X-Ray & Image Production:** X-Ray & Production, Interaction of Radiation with Matter, X-Ray film & its Processing, Dark Room Layout, Management of Radiographic Image Quality, Radiation Hazard & Protection In Radiology Department, PACS, DICOM, Portable & Mobile X-ray Units, DEXA, Dental Radiography.				
Unit 2:	**Ultrasound:** Principle & working of Ultrasound, Interaction of Ultrasound with matter, Transducer Construction & Its Types, Image display, Pre & post Processing Techniques, Doppler Imaging, USG Contrast Agent, Vascular Interventional Intra Operative 3D & 4D Imaging, Bioeffect & safety consideration, Quality Assurance in Ultrasound.				
Unit 3:	**Computed Tomography:** Basic Principle of CT, Instrumentation of CT, Image Display, CT Protocol, CT dosimetry, CT Artifacts, CT Interventional, Quality Assurance in CT,				

	PET CT, SPECT, DSA.
Unit 4:	**Mammography:** Mammography Instrumentation & Its working, Special Protocol of Mammography, BIRADS, Tomosynthesis, Layout of Mammography Room, Radiation Protection in mammography.
Unit 5:	**MRI:** MRI Principle & Its Instrumentation, Pulse Sequence in MRI, MRI Contrast media, MRI Artifacts, MR Protocol & Special Procedure, MRI Room Layout, Biohazards in MRI.
Textbooks:	1. Christensen's physics of diagnosis radiology. 2. Textbook of Radiology for Residents & Technicians (English, Paperback, Bhargava S.K.) 3. Basic Radiological Physics (English, Paperback, Kuppusamy Thayalan). 4. Grainger & Allison's Diagnostic Radiology Essentials (English, Hardcover, Grant Lee A. MBChB, BA (Oxon), MRCS, FRCR). 5. MRI (English, Electronic book text, Dale Brian M.)
Reference Books/ Additional Electronic Reference Material:	1. https://rads.web.unc.edu/wp-content/uploads/sites/12234/2018/05/Phy-MRI-Made-Easy.pdf 2. https://teachmeanatomy.info/the-basics/imaging/computed-tomography-ct-scans/