

16BM308 MEDICAL IMAGING TECHNIQUES

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	15	-	20	46	6	12	3	2



Course Description and Objectives:

This course offers the image reconstruction techniques, quality assurance test for radiography, method of recording sectional image, functioning of radioisotopic imaging equipment and the MRI, image acquisition and reconstruction, it also explains the 3-D image display techniques. The objective of the course is to impart knowledge on operation and medical applications of the major medical imaging techniques like CT, MRI, SPECT etc.

Course Outcomes:

The student will be able to:

- explain the basic principles of the major medical imaging techniques like CT, MRI, SPECT etc.
- explain the mode of operation and medical applications of the major medical imaging techniques.
- understand the advantages and disadvantages of the major imaging techniques to potential hazards for patients due to the CT, SPECT.

SKILLS:

- ✓ Differentiate the medical imaging techniques used behind MRI, CT, SPECT, PET etc.
- ✓ Distinguish the image formation in MRI.
- ✓ Obtain the knowledge of CT and other medical equipment.
- ✓ Image acquisition and processing of images for required model.

ACTIVITIES:

- *Know the processes involved in different image acquisition techniques.*
- *Attain knowledge on particle interaction with biological tissue.*
- *Calculate dose limits and differentiate between controlled areas and radiation hazards.*
- *Integration of CT_PET for structural and functional analysis of disease.*

UNIT - 1**L-9, T-3**

Basic Medical Imaging Modalities: X-ray, CT, Ultrasound, MRI, PET-CT, SPECT-CT, Gamma Camera, Catheterization Lab. Aspects of light imaging, convolutions and transforms, photometry lenses and depth of field, Image perception and 3D Imaging, Image acquisition, Display, Image processing operations, scanning & segmentation.

UNIT - 2**L-9, T-3**

Basic concepts of CT : Non Spiral CT technology, Concepts of Spiral CT Scanner, Multi Slice spiral technology, Various Peripheral devices. Applications: Multiplanar Reconstruction, Maximum Intensity Projection, 3D, CT Angio, Osteo, Dental, Perfusion (Body & Neuro), Virtual Endoscopy, Cardiac CT (Calcium scoring, Coronary Angiography, Lesion Quantification).

UNIT - 3**L-9, T-3**

Magnetic Resonance Imaging : Permanent & Super conducting magnets, Signal generation and detection, signal characteristics, signal localization, Fourier transforms in MRI, Imaging Reconstruction. Image artifacts. Coil technology, Parallel acquisition techniques, Various peripheral devices. Applications: Functional Imaging, Perfusion & Diffusion imaging (Echo planar imaging), Multi direction diffusion tensor imaging, Single & Multi Voxel Spectroscopy, MR Angiography, MRCP, Cardiac MRI (Myocardium viability, Valve function etc.,), Flow Quantification.

UNIT - 4**L-9, T-3**

Ultrasound Scanner: Principles of Ultrasound, Basic Ultrasound instrumentation, Imaging techniques (A mode, B Mode, 2B, B/M, 4B, Gated Mode, 3D, 4D, M-Mode, Echocardiography), Image recording devices, Image artifact, Biological effects.

UNIT - 5**L-9, T-3**

Gamma Camera: Physics of Gamma camera, basic Instrumentation, Imaging techniques, SPECT & Whole Body studies; Applications of Gamma camera in Cardiology, Nephrology, Neurology etc., PET : Fundamentals of PET scanner & PET-CT, Crystal technology, Cyclotron principle, Hot Lab equipments, Applications of PET ; Cardiology, Neurology & Cardiology.

TEXT BOOKS:

1. Hykes, Heorick, Starchman, Ultrasound physics and Instrumentation MOSBY year book, 2nd Ed., 1992.
2. Stewart C. Bushong, Magnetic Resonance Imaging- physical and biological principles, MOSBY, 2nd Ed., 1995.
3. Zhi-Pei Laing and Paul C. Lauterbur, Principles of Magnetic Resonance imaging –A signal processing perspective, Metin Akay (Editor), IEEE press, New York, 2000.