SEMESTER S7

MEDICAL IMAGING TECHNIQUES

Course Code	OEBMT723	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	None	Course Type	OE

Course Objectives:

1. To expose imaging methods in medicine and biology.
2. Learn the different methods and modalities used for medical imaging.

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SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	**Diagnostic Ultrasound Imaging:** Ultrasound interaction with tissue (Basics only) – Ultrasound waves and propagation, attenuation, reflection, scattering, refraction. Pulsed ultrasound and imaging - Pulsed ultrasound, pulse echo principle, Principles of image formation, Modes of ultrasound & applications - A-mode, B-mode & M-mode. Transducers-construction.	9
2	**Magnetic Resonance Imaging:** Basic principles of magnetic resonance – magnetic moment, FID, excitation and emission - principles of image formation, MRI instrumentation , Selective Applications of MRI for the Brain - Functional MRI (fMRI), MR Angiography, Diffusion MRI, MRI Fourier Reconstruction	9
3	**Computed Tomography:** Basics of X-ray - Properties & production – X-ray tube – Fixed anode type and rotating anode type, Principles of sectional imaging, generations of CT, spiral & multi slice CT, detectors used in CT, 2D image reconstruction techniques - Iteration and Fourier methods.	9

4	**Nuclear Imaging:** Concept of nuclear imaging, radiation detectors, Gamma camera, Emission computed tomography - SPECT & PET. **Hybrid Imaging** - MR-PET Instrumentation MR-PET system architecture. **Infrared Imaging** – Basic principle of thermal imaging, Physics of thermography – IR detectors.	**9**

Course Assessment Method

(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	**15**	**10**	**10**	**40**

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End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

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

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Understand the principle and instrumentation of diagnostic Ultrasound imaging	**K2**
CO2	Apply the principles of Nuclear Magnetic Resonance in medical imaging	**K3**
CO3	Explain the imaging methods used in Computed tomography	**K3**
CO4	Elucidate the concepts of multimodal imaging	**K2**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1			1			1	1		2
CO2	3	2	1			1			1	1		2
CO3	3	2	1			1			1	1		2
CO4	3	2	1			1			1	1		2

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

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Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	The Physics and Technology of Diagnostic Ultrasound	Dr Robert Gill	National library of Australia	2nd Edition 2020
2	MRI Basic Principles and Applications	Mark A Brown, Richard C Semelka	Wiley-Liss Publication	3rd Edition 2003
3	Webb's Physics of Medical Imaging	M Flower	Taylor & Francis	2016
4	Computed Tomography-E-Book: Physical Principles, Clinical Applications, and Quality Control	Seeram, Euclid	Elsevier Health Sciences	2015
5	Handbook of Biomedical Instrumentation	R. S. Khandpur	Tata MacGraw-Hill	3rd Edition 2014

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Diagnostic ultrasound Physics and Equipment	Hoskins, Peter R., Kevin Martin, and Abigail Thrush	CRC Press	2019
2	MRI Made easy	Hans H Schild	Berlex Laboratories	2012
3	Principles of Computerized Tomographic Imaging	AvinashiC KakMalcolm Slaney	Purdue University	2001
4	Nuclear Medicine Textbook, Methodology and Clinical Applications	Duccio Volterrani, Paola Anna Erba, Ignasi Carrió, H. William Strauss, Giuliano Mariani	Springer	2019

Video Links (NPTEL, SWAYAM…)	
Sl. No	**Link ID**
1	https://onlinecourses.nptel.ac.in/noc24_bt69/preview
2	https://onlinecourses.nptel.ac.in/noc24_ge45/preview

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