Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

of Arts, Science & Commerce

(Empowered Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for the TY (under NEP)

Program: B.Sc. MEDICAL IMAGING TECHNOLOGY

Title: DISCIPLINE SPECIFIC CORE

SEMESTER	:	**V**
TITLE	:	**DISCIPLINE SPECIFIC COURSE 1**
TITLE OF THE SUBJECT/COURSE	:	MRI Physics and Angiography
COURSE CODE	:	RJDSCMIT351
CREDITS	:	04
DURATION	:	60 hrs

LEARNING OBJECTIVES	
1	Understand the mechanism of MRI machine and its working in hospital set up.
2	Identify the main components of an MRI system (magnet, gradient coils, RF coils, computer system)
3	Understand how antibodies specifically bind to antigens to neutralize or eliminate pathogens.
4	Understand how signals are generated and converted into images. Describe common artefacts in MRA (turbulent flow, saturation, motion).
5	Recognize common MRI artefacts (motion, susceptibility, aliasing, etc.) Understand MRI safety principles (magnetic field hazards, SAR, patient screening).

Course Outcome No.	On completing the course, the student will be able to:	PSO Addressed	Bloom's Levels
CO1	Explain the principles of Time-of-Flight (TOF), Phase Contrast (PC), and Contrast-Enhanced MRA.Understand flow-related enhancement and how blood flow is visualized.	PSO13	I, II, III
CO2	Understand contrast agent (gadolinium) use and associated risks (e.g., NSF).Apply safety screening for vascular imaging patients.	PSO13	I, II, III
CO3	Define MR Angiography and its clinical applications.Differentiate MRA from conventional angiography and CT angiography.	PSO17	I, II, III

SEMESTER V			
Course Code: RJDSCMIT351		**Course Title: MRI Physics and Angiography**	**Credits**
Unit	**Unit Name**	**Topic**	**4**
I	MRI Physics	**Basic Principles of MRI:** Nuclear magnetic resonance, hydrogen protons, precession, Larmor frequency **Relaxation Mechanisms:** T1 (longitudinal), T2 (transverse), and T2 relaxation. **Pulse Sequences:** Spin Echo, Gradient Echo, FLAIR, Diffusion, Inversion Recovery, etc. **K-space & Image Formation:** Signal acquisition, Fourier transformation, spatial encoding with gradients. **MRI Hardware & Instrumentation:** Magnet types, gradient coils, RF coils, shim systems, computer systems. **Image Contrast & Parameters:** TR, TE, flip angle, weighting (T1, T2, PD), and how they affect images. **Artifacts & Safety in MRI:** Motion, aliasing, susceptibility, SAR, projectile effect, screening.	2
II	MRI Angiography	**Introduction to MR Angiography:** Definition, principles, and advantages over conventional/CT angiography. **Time-of-Flight (TOF) MRA:** Physics, technique, applications (e.g., intracranial vessels). **Phase-Contrast (PC) MRA:** Principle of velocity encoding, flow quantification, uses. **Contrast-Enhanced MRA (CE-MRA):** Role of gadolinium contrast, technique, and advantages. **Clinical Applications of MRA:** Brain, carotids, aorta, renal, and peripheral vascular imaging. **Artifacts & Limitations in MRA:** Flow-related artifacts, motion, turbulence, and pitfalls. **Safety Considerations in MRA:** Contrast safety (NSF risk), screening protocols, patient precautions.	2

References:

1. MRI Made Easy for Beginners by Chavan Govind
2. Magnetic Resonance Angiography: Principles and Applications by Springer

SEMESTER	:	V
TITLE	:	**DISCIPLINE SPECIFIC COURSE 2**
TITLE OF THE SUBJECT/COURSE	:	Protocols in MRI
COURSE CODE	:	RJDSCMIT352
CREDITS	:	04
DURATION	:	60 hrs

LEARNING OBJECTIVES	
1	Understand the mechanism of MRI protocols in various scans.
2	Identify the main protocols on basis of signs, symptoms and complaints.
3	Understand how different protocols help in image formation.
4	Understand how signals are generated and converted into images.

Course Outcome No.	On completing the course, the student will be able to:	PSO Addressed	Bloom's Levels
CO1	Explain the principles of usage of appropriate protocols in plain and contrast scans.	PSO13	I, II, III
CO2	Understand mechanism of TE, TR and other relevant parameters in MRI imaging	PSO13	I, II, III
CO3	Explain application of different protocols in diagnostic imaging.	PSO17	I, II, III

SEMESTER V			
Course Code: RJDSCMIT352		**Course Title:Protocols in MRI**	**Credits**
Unit	**Unit Name**	**Topic**	**4**
I	Foundation of MRI Protocol Design	Purpose, scope, and need for standardized protocols,Workflow in protocol planning, Ethical and safety considerations, T1, T2, GRE, STIR, FATSAT, PDI, DWI, Spectroscopy, COILS, MAGNETS. Usage of various pre procedure parameters in MRI protocols	2
II	Clinical protocols for MRI Imaging	MRCP, MRI Abdomen, Cardiac MRI, PErfusion MRI, MRi Brain, MRI Neck, MRA procedures. Epilepsy screening, lumbar spine screening, whole spine screening, knee MRI, shoulder joint MRI, MRI in case of pregnancy, MRI in case of infants, MRI in case of paediatrics.	2
References: 1.MRI Made Easy for Beginners by Chavan Govind			