

GANPAT UNIVERSITY											
FACULTY OF ENGINEERING & TECHNOLOGY											
Programme		Master of Technology			Branch/Spec.		Biomedical Engineering				
Semester		II			Version		1.0.0.0				
Effective from Academic Year			2018-19		Effective for the batch Admitted in			August 2018			
Subject code		3BM202		Subject Name		Medical Image Processing & Analysis					
Teaching scheme					Examination scheme (Marks)						
(Per week)		Lecture(DT)		Practical(Lab.)		Total					
		L	TU	P	TW			CE	SEE	Total	
Credit		3	-	1	-	4		Theory	40	60	100
Hours		3	-	2	-	5		Practical	30	20	50
Pre-requisites: Basic knowledge image processing techniques.											
<p>Learning Outcome: The educational objectives of the course are to educate students to attain the following:</p> <ul style="list-style-type: none"> To understand the basics of bio-medical image processing systems and to apply image processing concepts for medical images. To study the concept of medical images obtained with ionizing and non-ionizing radiation. To develop computer aided diagnosis in analyzing and quantifying biomedical data. Do quantitative analysis and visualization of medical images of numerous modalities such as PET, MRI, CT, or Ultrasound. 											
Theory syllabus											
Unit	Content									Hrs	
	Introduction to the overview and importance of the course.										
1	DIGITAL IMAGE and DIGITAL IMAGE FUNDAMENTALS: Elements of visual perception, Image formation model, Digital Image, Classification and types of digital image image sampling and quantization, some basic relationships between pixels, matrix and singular value representation of discrete image									05	
2	IMAGE TRANSFORMS: Introduction, Need for transform, Different types of transforms their properties and applications: Fourier Transform, Walsh, Hadamard, Slant, DCT, KL, Radon and Wavelet.									10	
3	DIGITAL IMAGE ENHANCEMENT: Image enhancement in spatial domain: Point processing and neighbourhood processing operations. Image enhancement in frequency domain: Filtering in frequency domain- smoothing, sharpening, Homomorphic filtering Image restoration									08	
4	SEGMENTATION AND FEATURE EXTRACTION: Intensity based segmentation, Edge based segmentation, Region based segmentation, segmentation by watersheds, snake algorithm, Clustering: Basics, K and C means clustering. Feature extraction: GLCM method, PSWARM optimization, Color image segmentation methods.									10	
5	MEDICAL IMAGE REGISTRATION: Introduction-dimensionality transformations -image registration algorithms surface based registration-head and hat algorithm, iterative closest point algorithm.									07	
6	MEDICAL IMAGE RECONSTRUCTION and ANALYSIS: CT image reconstruction, MRI image reconstruction, Angiographic image analysis, Retinal Image Analysis, Fat segmentation of MRI images, Computer-aided diagnosis in mammography.									05	
Practical content: Term Work and Practical shall be based on the above syllabus.											
Text Books:											
1	Rafael C., Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson Education Asia, Third Edition, 2007.										
2	S Jayaraman, S Esakkirajan and T Veerakumar, " Digital Image Processing", Tata McGraw Hill Education Private Ltd.										
3	Joseph V.Hajnal, Derek L.G.Hill, David J Hawkes, "Medical image Registration", Biomedical Engineering series, CRC press,2001.										
Reference Books											
1	Anil K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 2nd edition, 1997.										
2	Geoff Dougherty, "Signals and communication technology Medical image processing: Techniques and applications", Springer, 2011.										

