

GANPAT UNIVERSITY										
FACULTY OF ENGINEERING & TECHNOLOGY										
Programme		Bachelor of Technology			Branch/Spec.		Biomedical Engineering			
Semester		VIII			Version		2.0.0.0			
Effective from Academic Year			2017-18		Effective for the batch Admitted in				July 2017	
Subject code		2BM801		Subject Name		Biological Digital Image Processing				
Teaching scheme					Examination scheme (Marks)					
(Per week)		Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW						
Credit	4	-	1	-	5	Theory	40	60	100	
Hours	4	-	2	-	6	Practical	25	25	50	
Pre-requisites: Good Knowledge of mathematics, signal Processing concepts and basic programming.										
<p>Learning Outcome: The educational objectives of the course are to educate students to attain the following:</p> <ul style="list-style-type: none"> • Understanding of basics of image processing. • Learn and understand the concept of image processing in context of biomedical application. • To get fundamental knowledge of programming for medical image processing. • To study the image enhancement techniques, image restoration and image compression procedures. 										
Theory syllabus										
Unit	Content									Hrs.
1	DIGITAL IMAGE FUNDAMENTALS Image Acquisition and Display System, Digital image representation, Image characteristics & quality, Image viewing conditions, Elements of visual perception, a simple image formation model, image sampling and quantization, some basic relationships between pixels.									04
2	IMAGE ENHANCEMENT IN SPATIAL DOMAIN Background, Contrast and brightness manipulation, Basic gray level transformations, Histogram processing, Enhancement using arithmetic and logic operations, basic of spatial filtering, smoothing spatial filters, sharpening spatial filters.									12
3	IMAGE ENHANCEMENT IN FREQUENCY DOMAIN Background, Introduction to FT and frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homomorphic filtering, additional properties of the 2-D FT, convolution and correlation theorems.									12
4	IMAGE RESTORATION Model of Image Degradation/restoration process, Noise models, Modeling the Degradation Function, Inverse filtering, least mean square filtering, Constrained least mean square filtering Geometric transformations-spatial transformations.									08
5	INTERPOLATION & GEOMETRIC TRANSFORMATION Requirement of Interpolation, Types of Interpolation Techniques, Translation, Rotation, Scaling, Affine Geometric Transformation, Projective Geometric Transformation, Hough Transform.									04
6	IMAGE SEGMENTATION & MORPHOLOGICAL OPERATION Thresholding, Edge detection, Edge based Segmentation, Region based segmentation; Region growing, Region splitting and Merging, Segmentation by morphological watersheds, Erosion, Dilation, Opening, Closing, the Hit or Miss Transformation, Labeling Connected Component, Gray-scale Morphology.									10
7	COLOR IMAGE PROCESSING Color Fundamentals, Color Models, Pseudo-color Image Processing, Basic of Full Color image Processing.									02
8	IMAGE COMPRESSION & TRANSFORM Need for data compression, Types of Redundancy, Huffman, Run Length Encoding and Arithmetic coding. Basics of Discrete Cosine Transform & Wavelet Transform.									06
Practical content: Term Work and Practical shall be based on the above syllabus.										
Text Books:										
1	Digital Image Processing By Gonzalez, Woods, Pub.: Pearson education									
2	Image Processing, Analysis & Machine Vision By Milan Sonka, Pub.: Thomson Publication									

Reference Books	
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1	Fundamentals of Digital Image Processing By Anil K. Jain, Pub.: Pearson Education
2	Digital Image Processing By Willian K. Pratt, Pub.: John Wile