

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Bachelor of Technology				Branch/Spec.		Biomedical Engineering	
Semester		VII				Version		1.0.0.0	
Effective from Academic Year			2025-26			Effective for the batch Admitted n			July 2022
Subject code		2BM7106		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	3	-	1	-	4	Theory	40	60	100
Hours	3	-	2	-	5	Practical	30	20	50
Pre-requisites									
Good Knowledge of Physics and Mathematics, Fundamental of Medical Imaging.									
Course Outcomes									
On successful completion of the course, the students will be able to:									
CO1	Understand the role and fundamental of different components of a digital image processing.								
CO2	Apply and Evaluate the various spatial and frequency domain image enhancement techniques.								
CO3	Analyse the image restoration and Geometric Transformation techniques for image enhancement.								
CO4	Understand and Implement different methods of image segmentation and mathematical morphology.								
CO5	Learn different techniques of coding and image compression.								
CO6	Remember the various techniques for color image processing.								
Theory syllabus									
Unit	Content								Hrs.
1	DIGITAL IMAGE FUNDAMENTALS: Definition: Image, Digital image, Pixel, Image Acquisition and Display System, Digital image representation and its characteristics and image quality, Types of Images, Fundamental steps in image processing, Elements of visual perception, Image format and image data types, Image processing applications, 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.								09
3	IMAGE ENHANCEMENT IN FREQUENCY DOMAIN: Background, Introduction to FT and frequency domain, smoothing frequency domain filters, sharpening frequency domain filters, homomorphic filtering.								09
4	IMAGE RESTORATION: Model of Image Degradation/restoration process, Noise models, Restoration in presence of noise, Modelling the Degradation Function, Inverse filtering.								05
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, Need of morphological processing, Morphological operators: Erosion, Dilation, Opening, Closing, the Hit or Miss Transformation, Gray-scale Morphology.								08

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.	04
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		
1	Fundamentals of Digital Image Processing by Anil K. Jain, Pub.: Pearson Education.	
2	Digital Image Processing by William K. Pratt, Pub.: John Wile.	
3	Digital Image Processing by S,Sridhar , Pub.: Oxford University Press.	
ICT/MOOCs Reference		
1	https://nptel.ac.in/courses/117/105/117105079/	
2	https://nptel.ac.in/courses/117/105/117105135/	
3	https://nptel.ac.in/courses/106/105/106105032/	

Mapping of CO with PO and PSO:															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	0	0	0	0	0	1	0	0	1	0	2	1	0	0
CO2	3	1	2	1	0	0	2	0	0	0	1	3	2	2	1
CO3	2	1	2	1	0	0	1	0	0	0	1	3	3	2	0
CO4	3	1	1	1	0	0	0	0	0	0	0	1	1	2	1
CO5	2	1	1	1	0	0	0	0	0	0	0	1	2	1	0
CO6	1	1	1	1	0	0	0	0	0	0	0	1	1	1	0