

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Bachelor of Technology			Branch/Spec.		Mechatronics Engineering		
Semester		VII			Version		2.0.0.0		
Effective from Academic Year			2017-18		Effective for the batch Admitted in			July 2014	
Subject code		2MC705		Subject Name		DIGITAL IMAGE PROCESSING & MACHINE VISION			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50
Pre-requisites:									
A student has to understand following subjects before learning these subjects:									
<ul style="list-style-type: none"> Matrix operations and fundamental knowledge of Linear Algebra Working knowledge of random number and probability theory Applied Discrete Mathematics Programming knowledge of C/MATLAB 									
Learning Outcome:									
After successful completion of the course, student will be able to									
<ul style="list-style-type: none"> Represent and interpret image in its numeric and graphical form Understand geometric relationship of pixels Write simple codes for improving image quality Extract useful information from image contents through processing Understand and document needs for specific machine vision system Develop machine vision system based on requirement 									
Theory syllabus									
Unit	Content								Hrs
1	Introduction: Background, definition, Origin of DIP, Digital image representation, fundamental steps in image processing, elements of digital image processing systems, image acquisition, storage, processing, communication and display.								3
2	Digital Image Fundamentals: Structure of the human eye, image formation, brightness adaptation and discrimination, a simple image model, uniform and non-uniform sampling and quantization, some basic relationships between pixels, neighbors of a pixel, connectivity, Labeling. Relations, equivalence and transitive closure, distance measures, imaging geometry.								7
3	Image Enhancement in the spatial domain: Basic gray level transformations, histogram processing, Enhancement using arithmetic/logic operations, Basics of spatial filtering-comparison between smoothing and sharpening spatial filters.								6
4	Image Enhancement in the frequency domain: 1D Fourier transform-2D Fourier transform and its Inverse-Smoothing & sharpening frequency domain filters (Ideal, Butterworth, Gaussian)-homomorphic filtering.								4

5	Image compression: Fundamentals-Image compression, Error-free compression, Huffman coding, block coding, constant area coding, variable length coding, bit-plane coding, lossless predictive coding-source and channel encoding-decoding-Lossy compression, lossy predictive coding, transform coding.	8
6	Machine vision: Introduction, definition, Active vision system, Machine vision components, hardware's and algorithms, image function and characteristics, segmentation, data reduction, feature extraction, edge detection, image recognition and decisions, m/c learning, application of machine vision such as in inspection of parts, identification, industrial robot control, mobile robot application, Competing technologies, CCD line scan and area scan sensor, Videcon and other cameras, Triangulation geometry, resolution passive and active stereo imaging, laser scanner, data processing.	14
7	Industrial M/C vision: Industrial machine vision in production and services, structure of industrial m/c vision, generic standards, rules of thumb, illumination, optics, image processing, interfacing machine vision system, vision system calibration.	3
Practical content		
The Practical/term work shall be based on the topics mentioned above and will be defended by the candidates.		
Text Books		
1	Rafael C.Gonzalez and Richard E. Woods, "Digital Image Processing", Richard E. Woods.	
2	Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing using MATLAB", Main purpose-Practical	
3	Bershold Klaus, Paul Holm, "Robot vision", The MIT press.	
Reference Books		
1	N. G. Palan, "Digital Signal Processing", Tech-Max...Publication	
2	John G. Prokis, Dimitris G. Manolakis, "Digital Signal Processing (Principles, Algorithms and appls.)", PHI. Publication	
3	Alan V. Oppenheim, Ronald W. Schafer, "Discrete-Time Signal Processing", Pearson Edu...Publication	
4	A.K. Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India	