ITE1010	Digital Image Processing	L	T	P	J	C
		3	0	0	4	4
Pre-requisite	**MAT3004**	**Syllabus version**				
		1.0				

Course Objectives:

- To introduce the principles of image processing.
- To gain expertise in advanced image processing and analysis systems.
- To emphasize the areas such as restoration, enhancement, segmentation and their applications.

Expected Course Outcome:

1) Analyze general terminology of digital image processing.
2) Examine the core image enhancement techniques using Spatial and frequency domain.
3) Understand the core image enhancement techniques using various domains.
4) Identify and apply the knowledge by analysing various image compression techniques for effective solutions.
5) Design and create practical solutions to a range of common image processing problems and assess the results of their solutions.
6) Conduct the study and analysis of image segmentation and representation techniques.
7) Learn polygonal approximation, image representation and descriptors
8) Design and develop domain specific application using various digital image processing techniques.

Student Learning Outcomes (SLO):	**1, 14**
[1]	Having an ability to apply knowledge of mathematics, science, and engineering.
[14]	An ability to design and conduct experiments, as well as to analyze and interpret data

Module:1	**Digital Image Processing Fundamentals**	**6 hours**

Introduction, Digital Image Fundamentals, Image acquisition and display using digital devices - Human visual perception, properties –Image Sampling and Quantization-Basic Relationship between Pixels – Color models.

Module:2	**Image Enhancement in the Spatial Domain**	**6 hours**

Introduction- Basic grey level transformation, Histogram Processing, Enhancement using arithmetic/Logic operations – Spatial filtering: smoothing and sharpening.

Module:3	**Image enhancement in the frequency domain**	**6 hours**

Introduction to two-dimensional transforms-Discrete Fourier Transform, Discrete Cosine Transform, Discrete Wavelet Transform-smoothing frequency domain filtering-sharpening frequency domain filtering.

Module:4	**Image Restoration and Reconstruction**	**6 hours**
Noise Models – Restoration in the presence of Noise only- spatial filtering, periodic noise reduction by frequency domain filtering.		
Module:5	**Image Compression**	**7 hours**
Lossless Image Compression- The Concept of entropy and Huffman coding; Run-length coding for grey images, Lossy Image Compression – Predictive coding, transform coding – JPEG compression standard, Wavelet-based image compression JPEG2000.		
Module:6	**Image Segmentation**	**6 hours**
Detection of discontinuities- Object Detection Methods, Edge Linking and Boundary Detection, Thresholding Methods, Region Oriented Methods.		
Module:7	**Representation and Description**	**6 hours**
Chain codes, Polygonal approximation, Signature Boundary Segments, Skeletons. Descriptors: Boundary Descriptors, Regional Descriptors, Relational Descriptors.		
Module:8	**Contemporary issues:**	**2 hours**
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	R. C. Gonzalez, R. E. Woods, Digital Image Processing, Pearson Education, Third Edition, 2013.
Reference Books	
1.	S. Jayaraman, S. Esakkirazan, T.Veerakumar, Digital Image Processing, First Edition, Tata Mc Graw Hill, 2011
2.	A. K. Jain, Fundamentals of Digital Image Processing, Pearson Education (Asia) Pvt. Ltd. / Prentice Hall of India, 2015.
3	John C. Russ, The Image Processing Hand Book, Seventh Edition, CRC Press, 2017
4	B. Chanda and D. Dutta Majumdar, Digital Image Processing and Analysis, PHI, 2011

		Total Laboratory Hours	30 hours
Recommended by Board of Studies	05-03-2016		
Approved by Academic Council	No. 40	Date	18-03-2016