Paper code- CSME301 **Paper Name- Image Processing and Pattern Recognition**		**Marks: 100**
Module	**Topics**	**Hours**
Module-1: **Image Fundamentals**	Analog and digital images, image sensing and acquisition: Image formation, Sampling and quantization, Color space: Color (RGB, CMYK, HSI) vs gray level images, Matrix representation and intensity modification of digital images, Pixel adjacency and distance measure, Arithmetic, logical and set operations, Image file formats, Fundamental steps in DIP, Applications and state of the art in DIP.	6
Module-2: **Transformation and Filtering**	Point processing: Identity, image negatives, log transform, power law, contrast stretching, histogram equalization and specification. Spatial filtering: Linear filters: max, min, mean, median; order statistics filters. Frequency based transforms: Low and high pass filter, DFT Image restoration concept: Noise models, Image denoising and deblurring	10
Module-3: **Image segmentation**	Segmentation techniques, Threshold based segmentation, Importance of derivative and gradients in edge detection, Masks: Roberts, Prewitt, Sobel; Canny edge detection, Region growing and Split-Merge algorithms, Clustering based techniques, basics of Hough transform.	9
Module-4: **Image Compression**	Compression basics: Lossless, lossy, compression ratio, image compression models, evaluation criteria of a compression scheme, compression techniques: Huffman encoding, Run length, Arithmetic encoding.	5
Module-5: **Pattern recognition**	Introduction and applications. Feature extraction and reductions: Histogram of Gradient (HoG), Principal Component Analysis (PCA). Learning: Supervised and unsupervised; Clustering and Classification techniques: K-Nearest Neighbor Classifier, Support Vector Machine, K-means algorithm, Density-based Clustering.	10

Textbooks:

1. Digital Image Processing by Rafael C. Gonzalez, Richard E. Woods; Pearson; 4th edition (2017)
2. Image Processing: Principles and Applications by by Tinku Acharya, Ajoy K.Ray; Wiley-Interscience; 1st ed. (2005)
3. Digital Image Processing by William K. Pratt; John Wiley & Sons; 4th Edition (2007)
4. Digital image processing with MATLAB and LabView, Vipula Singh, Elsevier, 2013.
5. Pattern Classification by Richard O. Duda, David G. Stork, Peter E.Hart, Wiley; Second edition (2007)
6. Pattern Recognition by Sergios Theodoridis and Konstantinos Koutroumbas, Academic Press, 2008.
7. Pattern Recognition and Machine Learning by Christopher M. Bishop and Nasser M. Nasrabadi., New York: Springer, 2006.
8. Pattern recognition principles, Tou and Gonzalez, Addison Wesley, 1974.