5MCAEC21: DIGITAL IMAGE PROCESSING

Total No. of Hours: 52   **Hours/Week: 04**

Course Objective: To study the basic concepts and methodologies for digital image processing

Course Outcome: Students will be able to
CO1: Understand fundamentals of Digital image processing and various stages of Digital image processing
CO2: Learn spatial operations and use it for various image processing applications namely image enhancement, image sharpening and image resampling
CO3: Know frequency domain concepts and operations namely frequency domain filtering and apply it to enhance the images
CO4: Identify various noise and image degradation models and restore the images using filters
CO5: Understand various segmentation techniques and use it for object segmentation
CO6: Identify various morphological operations and apply to segment objects based on shapes

Unit I	**Fundamentals of Digital Image Processing**: Fundamental steps in digital image processing, Components of image processing visual perception, image sensing and acquisition, sampling and quantization, mathematical tools used in digital image processing.	8 hrs
Unit II	**Image transformations**: Intensity transformation functions, Fundamentals of spatial filtering, smoothing and sharpening spatial filters, Intensity transformations using fuzzy sets.	10 hrs
Unit III	**Filtering in the frequency domain**: Fourier series, Fourier transform of functions of continuous variable, Convolution, Discrete Fourier transformation of one variable, Sampling, Image interpolation and resampling, Moiré patterns, Properties of 2D discrete Fourier transform. Filtering basics and fundamentals.	14 hrs
Unit IV	**Image restoration and reconstruction**: Image degradation/restoration process, Noise models- spatial and frequency properties of noise, noise probability density functions, image construction from projection.	10 hrs
Unit V	**Morphological Processing:** Dilation and Erosion, Opening and Closing, Hit-or-miss transform. **Image Segmentation:** Point, line and edge detection, Thresholding (Different Techniques), Region growing, Region splitting and merging.	10 hrs

REFERENCE BOOKS
[1] Rafael C Gonzalez, Richard E Woods, "*Digital Image Processing*", Pearson education Third Edition.
[2] William K Pratt, "*Digital Image Processing*", John Willey, June 2010.
[3] A.K. Jain, "*Fundamentals of Digital Image Processing*", Prentice Hall of India, 2011.
[4] ChandaDutta, Magundar, "*Digital Image Processing and Applications*", Prentice Hall.