

## For Examinations to be held in the December 2021, 2022,2023

**Class: M.Tech 3rd Semester**  
**Branch: CSE**  
**Course Title: Digital Image Processing**  
**Course No.: MCSE31B**  
**Duration Exam: 3 HRS**

L	T	P	C	Theory (External)	Internal
3	-	-	3	75	25

**Course Overview:** This course provides a comprehensive introduction to digital image processing, and various image Transforms, Image Enhancement Techniques, Image restoration Techniques and methods, image compression and Segmentation used in digital image processing.

**Course Outcomes:** By the end of the course students shall be able to:

<b>CO31B.1</b>	Understand image formation for the acquisition of images.
<b>CO31B.2</b>	Get knowledge of existing algorithms for the processing of digital images.
<b>CO31B.3</b>	Apply knowledge/skills to solve industrial problems based on image processing.

### Detailed Syllabus

**Unit 1:** Introduction and Digital Image Fundamentals: Application of Image Processing, Image Processing definition, steps in Image Processing, Image Sensing and Acquisition, Image Sampling and Quantization, Spatial and Intensity, resolution-Effect of reducing spatial resolution, DPI, Effect of reducing image gray levels; Basic relationships between pixels and adjacency. **(06 hrs)**

**Unit 2:** Intensity Transformation and Spatial Filtering: Basics of intensity transformation and spatial filtering, intensity transformation functions-image negative, log transformation, power law; Piecewise-linear transformation functions-contrast stretching, intensity level slicing, bit plane slicing; Histogram Processing-histogram stretching, histogram equalization, Spatial Filtering, Spatial Correlation and Convolution, Smoothing Spatial Filters, order statistic filters, Sharpening Spatial Filters- The Laplacian, The Gradient-Robert cross gradient operator, Sobel operators. **(08 hrs)**

**Unit 3:** Image Restoration: Model of the image degradation/restoration process, Noise Models, Periodic Noise, Estimation of noise parameters, Restoration in the presence of noise-spatial filtering- Mean filters, Order-statistics filters, Median filter, Max and Min filters, Mid-point filter, Alpha-trimmed mean filter, adaptive filters. **(08 hrs)**

**Unit 4:** Color Image Processing: Introduction to the color image processing, color models: RGB, HSI, CMY/ CMYK; Conversion of color models: converting colors from RGB to HSI, HSI to RGB, RGB to CMY and CMY to RGB ; Pseudo coloring of images. **(06 hrs)**

**Unit 5:** Image Compression: Introduction to image compression, need of compression, methods of image compression: coding redundancy, spatial and temporal redundancy, irrelevant information, models of image compression, Huffman coding, Arithmetic coding, LZW coding, run-length coding, block transform coding, JPEG compression, predictive coding. **(07 hrs)**

**Note:** The Question paper will comprise of 7 questions of 15 marks each uniformly distributed over the entire syllabus based on teaching hours. The candidates shall have to attempt any 5 questions.

### **Suggested Books:**

- Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 3rd edition, Pearson Education.
- David A. Forsyth, Jean Ponce, "Computer Vision: A Modern Approach", Prentice Hall
- A.K. Jain, "Fundamental of Digital Image Processing", PH