III Year I Semester　　　　　　　　　　　　　　　　　　　　**L　T　P　C**

Code: 20EC5740　　　　　　　　　　　　　　　　　　　　**3　1　0　4**

INTRODUCTION TO DIGITAL IMAGE PROCESSING

Course Objectives:
1. Familiarize with fundamental concepts of digital image processing.
2. Learn various image processing techniques like image enhancement, image restoration, image compression and segmentation.
3. Understand the fundamental concepts of morphological image processing and how to implement them.
4. Gain experience in applying various image processing algorithms to solve real world problems.

UNIT- I: DIGITAL IMAGE FUNDAMENTALS:
Introduction to Image Processing, Fundamental steps in digital image processing, Elements of visual perception, image sampling and quantization, Basic relationships between pixels, Introduction to the mathematical tools used in digital image processing. Image types and formats: Binary image, Gray image, Color image, Color fundamentals, Color models: RGB, HSI and CMY.

UNIT-II: IMAGE ENHANCEMENT:
Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, and sharpening spatial filters. **Filtering in the Frequency Domain:** Preliminary concepts, the basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters.

UNIT-III: IMAGE RESTORATION:
A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter.

UNIT-IV: IMAGE COMPRESSION AND SEGMENTATION:
Image compression: Fundamentals, Image compression model, Basic compression methods: Huffman coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding and Predictive coding. **Image segmentation:** Fundamentals, point, line, edge detection, thresholding, and region based segmentation.

UNIT-V: MORPHOLOGICAL IMAGE PROCESSING:
Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Course Outcomes:

A student who successfully fulfils this course requirement will be able to:

S. No	Course Outcome	BTL
1.	Understand the fundamental concepts of digital image processing.	L2
2.	Apply image enhancement techniques in spatial and frequency domain.	L3
3.	Implement various filters for image restoration.	L4
4.	Evaluate and execute compression and segmentation techniques for digital images.	L4
5.	Apply morphological algorithms for image processing applications.	L3

Correlation of Cos with Pos & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO 4	3	2	-	-	-	-	-	-	-	-	-	-	2	-
CO 5	3	2	-	-	-	-	-	-	-	-	-	-	2	-

Text Books:

1. Rafel C. Gonzalez and Richard E. Woods, Digital Image Processing, Pearson Education, 3rd Edition, 2011.
2. S. Sridhar, Digital Image Processing, Oxford publishers, 2nd Edition, 2016.

Reference Books:

1. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson Education, 2015.
2. S. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw Hill Education, 2011.