Course Type	Course Code	Name	L	T	P	Credits
DE	NCSD505	Image and Video Processing	3	0	0	3

Course Objective

To provide basic and fundamental knowledge on different phases of digital image processing. Describe in brief the fundamental knowledge on video processing. The proposed syllabus is designed in such manner to provide better practical and research understanding for students in the field of image and video processing.

Learning Outcomes

Upon successful completion of the course, the students should be able to:

· Explain and apply the basic and fundamental methods on digital image processing and video processing.

· Use these methods in subsequent courses like pattern recognition and computer vision.

· Apply the knowledge primarily obtained by studying examples and cases in the field of engineering disciplines.

· Prepare for research interest using recent techniques for solving real life problems.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Digital Image Fundamentals: Image Model, Basic Phases, History, Human Visual System, Image Sampling and Quantization, Pixel Geometry.	4	Understanding of the fundamentals of digital image processing and pixel geometry.
2	Image Enhancement: Contrast Enhancement, Histogram Processing, Point Processing, Spatial Domain Filtering, Edge Sharpening, Frequency Domain Filtering.	6	To understand different mathematical principles and current techniques used in image enhancement in spatial and frequency domain.
3	Image Restoration: Noise Models, Image Restoration Filtering, Motion Blur Removal, Geometric Corrections.	3	To understand fundamental knowledge about image restoration techniques used in digital image processing.
4	Image Morphology: Fundamental Operations, Morphological Algorithms, Mathematical Examples.	3	Understanding of different operations used in image morphology and corresponding mathematical examples.
5	Image Segmentation: Pixel-based Segmentation, Multi-level and Adaptive Thresholding, Optimal Thresholding, Region-based Segmentation, Point and Line Detection, First and Second Order Edge Operators, Canny Edge Detector, Hough Transform.	6	To understand the basic principle of image segmentation, different types of segmentation methods and their used in real applications.

6	Image Compression: Redundancy and Compression Models, Lossless and Lossy Compression Schemes– Run Length, Shannon-Fano, Huffman, Arithmetic Coding, Block Truncation, Vector Quantization, JPEG Standard.	6	To understand efficient storage and compression techniques (lossy and lossless) to analyze the constraints in image processing when dealing with larger data sets.
7	Image Representation and Description:FreemanChain Coding, Polygonal Approximation, Boundary Segments, Skeletons; Boundary, Regional, Topological, and Relational Descriptors.	3	Understanding of different techniques used for image representation as well as description.
8	Multiresolution Analysis and Wavelet: Pyramidal Coding, Subband Coding, Application of Wavelets.	3	Understanding the effect of multiresolution analysis and its different techniques used in digital image processing.
9	Video Processing: Introduction, Video Formats, Motion Detection and Estimation, Video Enhancement and Restoration, Video Segmentation.	8	Understanding of different phases of video processing in brief.
	Total	**42**	

Text Books:

1. Digital Image Processing, R. C. Gonzalez and R. E. Woods, Pearson Education.

2. Handbook of Image and Video Processing, AL Bovik, Academic Press.

Reference Books:

1. Digital Image Processing and Analysis, B. Chanda and D. Dutta Mazumdar, PHI.

2. Fundamentals of Digital Image Processing, A. K. Jain, Pearson India Education.

3. Digital Image Processing, W. K. Pratt, Wiley-Interscience.