Course Code	Course Title	L	T	P	C
BCSE403L	**Digital Image Processing**	**3**	**0**	**0**	**3**
Pre-requisite	**NIL**	**Syllabus version**			
		1.0			

Course Objectives

1. To provide the basic knowledge on image processing concepts.
2. To develop the ability to apprehend and implement various image processing algorithms.
3. To facilitate the students to comprehend the contextual need pertaining to various image processing applications.

Course Outcomes

1. Ascertain and describe the basics of image processing concepts through mathematical interpretation.
2. Acquire the knowledge of various image transforms and image enhancement techniques involved.
3. Demonstrate image restoration process and its respective filters required and attain the knowledge of color image processing techniques.
4. Experiment the various image segmentation and morphological operations for a meaningful partition of objects.
5. Design the various basic feature extraction procedures and illustrate the various image compression techniques and their applications.

Module:1	**Digital Image Fundamentals**	**6 hours**

Introduction: Digital Image, Applications, Fundamental steps of Digital Image Processing, Components of an Image Processing System, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationship between pixels, Mathematical Tools used in Digital Image Processing.

Module:2	**Intensity Transformations and Spatial Filtering**	**6 hours**

Intensity Transformation Functions, Spatial Enhancement Techniques - Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

Module:3	**Image Transforms and Filtering in the Frequency Domain**	**6 hours**

Discrete Fourier Transform, Discrete Cosine Transform, Smoothing in the Frequency Domain, Sharpening in the Frequency Domain, Wavelet Transformation - Haar Transform.

Module:4	**Image Restoration and Color Image Processing**	**6 hours**

Model of Image Degradation/Restoration, Noise models, Restoration in the presence of noise only spatial filtering, Inverse filtering, Weiner filtering, Color Fundamentals, Color Models, Color Image Smoothing and Sharpening.

Module:5	**Image Segmentation and Morphological Image Processing**	**7 hours**

Point, Line and Edge Detection, Edge Based Segmentation - Thres holding based segmentation, Region growing and Region splitting and merging, Segmentation using morphological water sheds, Erosion, Dilation, Opening, Closing, Hit or Miss Transform, Thinning, Thickening, Skeletonization.

Module:6	**Feature Extraction**	**6 hours**

Boundary Preprocessing, Boundary feature descriptors, Histogram based features, Homogenous region extraction and representation, Texture descriptors, GLCM, LBP, SIFT, SURF.		
Module:7	**Image Compression and Watermarking**	**6 hours**
Lossless compression versus lossy compression, Huffman coding, Arithmetic coding, Block Truncation coding, JPEG, Digital Image Watermarking – visible and invisible watermarking – digital watermarking based on DWT.		
Module:8	**Recent Trends**	**2 hours**
Guest lectures from Industry and, Research and Development Organizations		
	Total Lecture hours:	**45 hours**

Text Book(s)	
1.	Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, Fourth Global Edition, Pearson Education Limited, United States, Printed in Malaysia, 2018.
Reference Books	
1.	S. Sridhar Digital Image Processing, Second Edition, Oxford University Press, India, 2016
2.	William K. Pratt, Digital Image Processing, John Wiley, 4th Edition, 2007.
Mode of Evaluation: CAT, Assignments, Quiz, FAT.	

Recommended by Board of Studies	12-05-2023		
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