	National Institute of Technology Meghalaya An Institute of National Importance	CURRICULUM

Programme	**Bachelor of Technology in Computer Science and Engineering**	Academic Year of Regulation	**2018-19**
Department	**Computer Science and Engineering**	Semester	**VII**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
CS 421	Image Processing	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	To introduce the use of the components of digital image processing fundamentals	Course Outcomes	CO1	Able to acquire knowledge about the basic concepts used in Image processing.
	To introduce the mathematical foundation related in this domain.		CO2	Able to interpret the image processing fundamentals: hardware, software, digitization
	To introduce ability to apply image processing techniques in both the spatial and frequency (Fourier) domains.		CO3	Able to implement various algorithms for various edge detection, feature detection.
	To provide an understanding of description and analysis of how digital images are represented, manipulated, encoded and processed.		CO4	Able to describe the importance of image segmentation and restoration.
			CO5	Students will be able to acquire knowledge about various distributed Programming Model.
	Provide an understanding with emphasis on algorithm design, implementation and performance evaluation.		CO6	Students will be able to understand the Comparison of various Compression methods.
	To be able to discuss the real life application of image processing in various problems.			

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**2**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**3**	**0**	**3**
2	CO2	**1**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**2**	**0**	**2**
3	CO3	**1**	**2**	**3**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**3**	**2**
4	CO4	**0**	**2**	**3**	**0**	**2**	**2**	**3**	**0**	**2**	**0**	**0**	**1**	**2**	**3**	**2**
5	CO5	**0**	**2**	**3**	**0**	**2**	**2**	**0**	**0**	**2**	**0**	**0**	**1**	**3**	**3**	**3**
6	CO6	**0**	**0**	**1**	**2**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**1**	**2**	**2**	**0**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction** Background, definition, Origin of DIP, Digital image representation, fundamental steps in image processing, elements of digital image processing systems, image acquisition, storage, processing, communication and display, effect of Aliasing and Jaggles, Advantages of high resolution systems DDA line algorithms: Bresenhams line and circle derivations and algorithms. Metric and topological properties of Digital Images, Histogram, entropy, Visual Perception, Image Quality, image smoothing, Edge detectors and quantification measures	08	CO1 CO2
II	**Segmentation:** Threshold detection methods, Optimal Thresholding, Edge based Segmentation-Edge image thresholding, Edge relaxation, Border tracing, Hough Transforms, Region based segmentation: Region Splitting, Splitting and Merging, Watershed Segmentation.	07	CO2 CO3
III	**Image Enhancement in the spatial domain:** Basic gray level transformations, histogram processing, Enhancement using arithmetic/logic operations, Basics of spatial filtering-comparison between smoothing and sharpening spatial filters. **Image Enhancement in the frequency domain:** 1D Fourier transform-2D Fourier transform and its Inverse-Smoothing & sharpening frequency domain filters (Ideal, Butterworth, Gaussian)-homomorphic filtering.	10	CO2 CO3
IV	**Mathematical Morphology**: Basic Mathematical Concepts, Binary dilation and Erosion, Opening and closing, Gray Scale dilation and erosion, Skeleton, Thinning , Thickening Ultimate erosion, Geodesic transformations, Morphology and reconstruction, Morphological Segmentation	05	CO4 CO3 CO4
V	**Cyber Image Analysis:** Image Forgery, Types of image forgery, different tampering methods, detection and classification of image forgery	06	CO4 CO5
	Total Hours	36	

Essential Readings

1. Digital Image Processing, By Rafael C. Gonzalez, Richard E. Woods,PHI, 3rd edition
2. Fundamentals of Digital Image Processing, by A.K. Jain, Prentice Hall of India, 2011
3. Digital Image Processing and Analysis: Application with MATLAB and CVIP tools, 3rd Edition, SE Umbaugh, Taylor&Francis/CRC Press, 2018

Supplementary Readings

1. Digital Image Processing and Pattern Recognition, By Malay K. Pakhira, First Edition, PHI Learning Pvt. Ltd., 2011.
2. Hands-On Image Processing with Python, by Sandipan Dey, Publisher: Ingram short title, 2018
3. Digital Image Processing, By Willliam K Pratt, John Willey, 2002.