NITK –Surathkal
Department of Computer Science & Engineering
Course Plan

CO414 – Digital Image Processing

Name of the Course: Digital Image Processing	Course No: CO414	No. of Credits (L-T-P): 3-0-0 (3)
Year & Semester, Section: 2020, VI Sem	Course Type: Elective (PSE)	Academic Session: Odd

Prerequisites (if any): None

Name and Contact Details of Course Instructor: Jeny Rajan, jenyrajan@nitk.edu.in.

Evaluation Scheme: Course project/viva voce/new ideas/assignments - 20%, Practical exam - 20%, Mid Sem - 20%, End Sem - 40%.

Course Objectives

1. To learn the fundamental concepts in digital image processing.
2. To analyze images in both spatial and frequency domains.
3. To design and implement image processing algorithms in MATLAB/Python.
4. Apply image processing algorithms in practical applications.

Course (Learning) Outcomes (COs)

CO1 – Understanding image formation process, related terminologies and image quality metrices.
CO2 – Should be able to apply basic image processing algorithms to analyse, enhance or segment given images and to use right tools to solve the given problem.
CO3 – Design and create practical solutions to common image processing problems.
CO4 – Enhance research skills through discussions and implementation of state-of-the-art techniques.

Mapping of COs with POs:

(Strength of correlation: S-Strong, M-Medium, W-Weak)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	W	W	W	W	M	W	W
CO2	S	S	S	S	S	W	W	W	W	M	W	W
CO3	S	S	S	S	S	M	S	M	M	S	S	S
CO4	S	S	S	S	M	W	M	M	M	M	S	W

1. Teaching Learning Interaction

Module – Title		Content	L-T-P hours
M1	Introduction and	Introduction to image processing, applications, image sampling and quantization, basic relationship between pixels	2-0-0

	fundamentals		
M2	Image Enhancement in Spatial Domain	Basic gray level transformations, point operations, Histogram processing, Spatial operations, Convolution, image smoothing and sharpening.	10-0-0
M3	Image Enhancement in Frequency domain	Introduction to Fourier transform and frequency domain, Smoothing frequency domain filters, sharpening frequency domain filters, implementation of frequency domain filters.	6-0-0
M4	Image Restoration	Noise models, Noise reduction in spatial domain, Noise reduction in frequency domain, state-of-the-art filters for denoising images corrupted with various kinds of noise.	8-0-0
M5	Morphological Image Processing	Basic concepts, Dilation and Erosion, Opening and Closing, Hit or Miss transformations (both binary and gray scale images)	4-0-0
M6	Image Segmentation	Detection of discontinuities (point, line and edge detection), classical edge detection methods, thresholding, Hough transform, clustering methods, region-based segmentation, Texture segmentation.	8-0-0
M7	Color image Processing	Color fundamentals, Different color models, Smoothening and sharpening of color images, color image segmentation, edge detection, denoising of color images.	4-0-0

2. List of Text Books & Reference Books, On-line Course Resources

1. Rafael C. González, Richard E. Woods, "Digital Image Processing", 3rd Ed., PHI, 2007.
2. Anil K. Jain, "Fundamentals of Digital image Processing", Prentice Hall, US Ed., 1989.
3. Rafael C. González, Richard Richard Eugene Woods, Steven L. Eddins, "Digital Image Processing using MATLAB", Pearson Education India, 2004.
4. Willam K Pratt, Digital Image Processing, Wiley-Interscience Publication, Third Edition, 2001.
5. AL Bovik (Editor), "Handbook of Image and Video Processing", Academic Press

3. Suggested list of Assignments / home works /problems/ ANY OTHER:

Brief description of assignments.

Assignment and Title	Contents
Comparative study of selected image denoising methods.	State-of-the-art methods like non-local means, bilateral filter and BM3D
MRI brain image segmentation	Segmentation of gray matter, white matter and CSF from MRI brain images.

Assignment and Title	Contents
Vehicle number place segmentation	Segmentation and classification of characters and numbers from vehicle number plate.

Other: Course project

4. Laboratory Instructions (if any): Nil

5. Assessment Pattern
(Use Bloom's Taxonomy to design rubrics for evaluating student performance)

Level No.	Knowledge Level	Evaluation Component					Assessment (%)
		Course project/viva voce/assignments (20%)	Practical exam (20%)	Mid Sem (20%)	Final Exam (40%)		
K1	Remember	10%	10%	10%	10%		6.8
K2	Understand	20%	20%	20%	20%		20
K3	Apply	20%	25%	20%	20%		18
K4	Analyse	20%	15%	20%	20%		18
K5	Evaluate	20%	20%	20%	20%		18
K6	Create	10%	20%	10%	10%		19.2
							100%

Sd/-
Jeny Rajan.