



Department of Computer Science & Engineering

National Institute of Technology, Jamshedpur

(An Institution of national importance under MHRD, Govt. of India)

ANTUMN SEMESTER (B.Tech 7th Sem.)

Course Handout

Course No. : CS705
Course Title : Digital Image Processing (4-1-1)
Instructor-in-charge : Dr. Koushlendra Kumar Singh

Course Objective: to expose students to advance techniques of Image Processing and their engineering applications.

REFERENCES:

- Digital Image Processing: Rafael C. Gonzalez, Richard E. Woods, Third Edition, Pearson Education,
- Fundamentals of digital image processing, Anil K. Jain, Prentice Hall
- Digital Image Processing by William K Pratt

PRE-REQUISITES:

Basic concept of signal processing, High school mathematics, C/C++ programming skill, Probabilistic Methods, Basics of calculus.

Course Plan:

Serial No.	Topics	No. of Lectures	Gonzalez Chapters
1.	Introduction to Image Processing Image Processing and related field, Fundamental Steps in DIP, Components of an Image Processing System	1-2	1
2.	Classification of Image Processing operations Details of Image processing operations, , basic relationship, distance metrics, Arithmetic Operations, Logical operation, Set operation, Statistical Operation, Sampling and Quantization,	3-6	2,3
3.	Intensity Transforms and Spatial filtering Backgrounds, basics of intensity transforms and spatial filtering, Intensity transform function, Image negative, Log transformation, Power-low transformation, piecewise linear transformation, Histogram processing, Histogram Equalization, Histogram Matching, Local Histogram Processing, Histogram statics for image enhancement, Smoothing spatial filters, sharpening spatial filters, The Laplacian, The Gradient, Unsharp masking	7-13	3

Serial No.	Topics	No. of Lectures	Gonzalez Chapters
4.	Filtering in the frequency domain Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering	14-20	4
5.	Wavelet and Mutiresolution Processing Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking	21-25	7
6.	Morphological Image Processing Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion	26-31	9
7.	Image Restoration Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques, Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.	32-39	5
8.	Image Segmentation Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform, Thresholding, Iterative thresholding, Otsu's method, Moving averages, Multivariable thresholding, Region-based segmentation, Watershed algorithm, Use of motion in segmentation	40-44	11

Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
2.	Mid Term	60 Min	30%		Open Book
3	End Sem Exam	3 Hrs	40%		Open Book
4.	Assignment		5%		Take Home
5.	Surprise Quizzes/ Project/ Attendance		25%		Presentation

Instructor In-Charge