BSc(H) Computer Science, V Semester (LOCF)

Digital Image Processing (BHCS16A) Discipline Specific Elective - (DSE)

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| S.No. | Topic | Reference[1] | Lectures |
| 1 | **Introduction: Digital Image Fundamentals** Brightness, Adaptation and Discrimination, Light and Electromagnetic Spectrum, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Types of images | **Ch 1**  1.1 (pp -18-19),1.4 (pp 41-43)  **Ch 2**  2.1(pp 50-54)  2.2(pp 54-57, 61-63)  2.4(pp 63-79)  2.5(pp 79-83) | 8 |
| 2 | **Spatial Domain Filtering** Some Basic Intensity Transformation Functions, Histogram Equalization, Spatial Correlation and Convolution, Smoothening Spatial Filters: Low pass filters, Order Statistics filters, Sharpening Spatial Filters: Laplacian filter | **Ch 3**  3.1(pp 120-122)  3.2,3.3(pp 122-140), 3.4(pp 153-160),  3.5(pp 164-175),  3.6(1pp 75-182) | 10 |
| 3 | **Filtering in Frequency Domain**  The Discrete Fourier Transformation (DFT), Frequency Domain Filtering: Ideal and Butterworth Low pass and High pass filters, DCT Transform (1D, 2D). | **Ch 4**  4.4(pp 225-229),  4.5(pp 230-232,240) 4.7(pp 260-268),4.8(pp 272- 276, 278-281), 4.9(pp 284-289) ch 7 (pp 487-488) | 10 |
| 4 | **Image Restoration:** Image Degradation/Restoration Process, Noise models, Noise Restoration Filters | **Ch 5**  5.1(pp 318),  5.2(pp 318-325),  5.3(pp 327- 332) | 8 |
| 5 | **Image Compression:** Fundamentals of Image Compression, Huffman Coding, Run Length Coding, JPEG. | **Ch 8**  8.1(pp 540-553),  8.2(pp 553-556),  8.6(pp 566-571) 8.9(pp 588-589) | 6 |
| 6 | **Morphological Image Processing:** Erosion, Dilation, Opening, Closing, Hit-or-Miss Transformation, Basic Morphological Algorithms. | **Ch 9**  9.1-9.5 (pp 636-666) | 10 |
| 7 | **Image Segmentation:** Point, Line and Edge Detection, Thresholding, Region Based Segmentation. | **Ch 10**  10.1, 10.2(pp 700-723, 735-736), 10.3(742-751), 10.4(764-770) | 8 |

**References**

1. Gonzalez, R. C., & Woods, R. E. (2017). Digital Image Processing. 4th edition. Pearson

Education.

2. Jain, A. K. (1988). Fundamentals of Digital Image Processing. 1st edition Prentice Hall of

India.

**Additional Resources**

1. Castleman, K. R. (1995.). Digital Image Processing. 1st edition. Pearson Education

2. Gonzalez, R. C., Woods, R. E., & Eddins, S. (2004). Digital Image Processing using

MATLAB. Pearson Education Inc.

3. Schalkoff, D. (1989). Image Processing and Computer Vision. 1st edition. John Wiley and

Sons.

**Practical List**

1. Write program to read and display digital image using MATLAB or SCILAB

a. Become familiar with SCILAB/MATLAB Basic commands

b. Read and display image in SCILAB/MATLAB

c. Resize given image

d. Convert given color image into gray-scale image

e. Convert given color/gray-scale image into black & white image

f. Draw image profile

g. Separate color image in three R G & B planes

h. Create color image using R, G and B three separate planes

i. Flow control and LOOP in SCILAB

j. Write given 2-D data in image file

2. To write and execute image processing programs using point processing method

a. Obtain Negative image

b. Obtain Flip image

c. Thresholding

d. Contrast stretching

3. To write and execute programs for image arithmetic operations

a. Addition of two images

b. Subtract one image from other image

c. Calculate mean value of image

4. To write and execute programs for image logical operations

a. AND operation between two images

b. OR operation between two images

c. Calculate intersection of two images

d. NOT operation (Negative image)

5. To write a program for histogram calculation and equalization using

a. Standard MATLAB function

b. Program without using standard MATLAB functions

6. To write and execute program for geometric transformation of image

a. Translation

b. Scaling

c. Rotation

d. Shrinking

e. Zooming

7. To understand various image noise models and to write programs for

a. image restoration

b. Remove Salt and Pepper Noise

c. Minimize Gaussian noise

d. Median filter

8. Write and execute programs to use spatial low pass and high pass filters

9. Write and execute programs for image frequency domain filtering

a. Apply FFT on given image

b. Perform low pass and high pass filtering in frequency domain

c. Apply IFFT to reconstruct image

10. Write a program in C and MATLAB/SCILAB for edge detection using different edge

detection mask

11. Write and execute program for image morphological operations erosion and dilation.