

**B.Sc. Program Physical Science/Mathematical Science  
(Computer Science Courses) Vth Sem  
Discipline Specific Elective (DSE) – Digital Image Processing (BSCS05B)**

Sr.No.	Topic	Chapter	# of Lectures	Reference
1.	<b>Introduction</b> Fundamental steps in digital image processing (DIP), applications of DIP, components of image processing system.	Ch 1 [1.1-1.5] pp 23-52	4	1
2.	<b>Digital Image Fundamentals</b> Elements of visual perception (Human eye, electromagnetic spectrum), Image acquisition, sampling and quantization, basic relationships between pixels.	Ch 2 [2.1-2.5] pp 58-94	4	1
3.	<b>Image Enhancement in spatial domain</b> Basics of Intensity transformation and spatial filtering, Basic intensity transformation functions, histogram equalization, smoothing and sharpening filters.	Ch 3 [3.1, 3.2, 3.3.1, 3.4, 3.5, 3.6] pp127-149, 166-190	12	1
4.	<b>Image enhancement in frequency domain</b> Frequency transform, enhancement filters in frequency domain	Ch 4 [4.4, 4.5.5, 4.7, 4.8(Till 4.8.3), 4.9 (Till 4.9.4)] pp 242-246, 257, 277-299, 302-309	14	1
5.	<b>Compression</b> DCT, JPEG Compression	Ch 8 [8.1 (Till pp 549), 8.1.6, 8.1.7, 8.2.8(Till pp 592)] pp 548-549,558-563, 588-592	6	1
6.	<b>Morphological Image processing</b> Erosion, dilation, opening , closing, Hit-or-miss transform, some basic morphological algorithms including boundary extraction, convex hull, thinning and thickening.	Ch 9 [9.1, 9.2, 9.3, 9.4, 9.5 (Till 9.5.6)] pp 650-672	12	1

7.	<b>Image Segmentation</b> Detection of discontinuities, edge linking and basic thresholding.	Ch10 [10.1, 10.2 (except 10.2.6), 10.3 (till 10.3.3)] pp 712-735, 747-769	8	1
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## References

1. Gonzalez, R. C., & Woods, R. E. (2008 ). *Digital Image Processing*. 3rd Edition. Pearson Education.

## Additional References

1. Castleman, K. R. (1996). *Digital Image Processing*. Pearson Education
2. Gonzalez, R. C., Woods, R. E., & Eddins, S. (2004). *Digital Image Processing using MATLAB*. Pearson Education, Inc.
3. Jain, A. K. (1994). *Fundamentals of Digital Image Processing*. Prentice Hall of India
4. Schalkoff, R.J. (1989). *Digital Image Processing and Computer Vision*. New York: John Wiley and Sons.

## **Digital Image Processing Lab**

1. Write programs to read and display digital images 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. Separate color image in three R G & B planes
  - g. Create color image using R, G and B three separate planes
  - h. To display 2-D image data
2. To write programs using point processing method to implement the following image processing operations:
  - a. Obtain Negative image
  - b. Obtain Flip image
  - c. Thresholding
  - d. Contrast Stretching
3. To write 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 programs for image logical operations:
- a. AND operation between two images
  - b. OR operation between two images
  - c. Calculate intersection of two images
5. To write a program for histogram calculation and equalization using standard MATLAB function
6. To write programs for geometric transformation of image:
- a. Shrinking
  - b. Zooming
8. Write programs to remove noise using spatial filters:
- a. Understand 1-D and 2-D convolution process
  - b. Use 3x3 Mask for low pass filter and high pass filter
9. Write 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 for edge detection using different edge detection masks.
11. Write a program to implement image morphological operations: erosion and dilation.