

Digital Image Processing

- 1.1 Course Number: CS431
- 1.2 Contact Hours: 2-0-2 Credits: 8
- 1.3 Semester-offered: 4th Year-Even
- 1.4 Prerequisite: NA
- 1.5 Syllabus Committee Member: Dr. Sushum Biswas, Dr. Daya Sagar Gupta & Dr. Gargi Srivastava
2. **Objective:** The student should be made to learn Digital Image Fundamentals, Spatial Domain transformation, Frequency domain transformation, Image restoration, Color image processing, wavelets, morphological transformation, image segmentation etc. Primary objectives will be to
- Learn digital image fundamentals.
 - Be exposed to simple image processing techniques.
 - Be familiar with image compression and segmentation techniques.
 - Learn to represent images in the form of features.

3. **Course Content:**

Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	DIGITAL IMAGE FUNDAMENTALS	Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – color models.	8
2	IMAGE ENHANCEMENT	Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering	5
3	Frequency Domain	Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.	5
4	IMAGE RESTORATION AND SEGMENTATION	Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering	6
5	Wiener filtering Segmentation	Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.	3
Total			27

4. Readings

4.1 Textbook:

Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.

4.2 Reference books:

- Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
- Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.
- William K Pratt, "Digital Image Processing", John Willey, 2002.
- Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.

5 **Outcome of the Course:** Upon successful completion of this course, students will be able to:

Discuss digital image fundamentals.

Apply image enhancement and restoration techniques.

Use image compression and segmentation Techniques.

Represent features of images.