

7. List of Topics: 422CPE – Digital Image Processing and Vision

List of Topics for Theory:

- **Introduction:** Representation of an Image, - elements of visual perception - simple image formation model – Digital Image processing, Levels of Image Processing, History of Image processing, Applications of Image processing, Basic relationship between pixels, Adjacency, Types of Adjacency, connectivity, Fundamental Steps in Digital Image Processing, Types of Images, Data –Type Conversions,
- **Image Improvement:** Image enhancement - Spatial domain methods - point processing - intensity transformations, image subtraction, image averaging. Thresholding, Contrast Enhancement, Inverse Log, Identity Functions, Image Negative Functions, Spatial Resolution, Reducing Spatial Resolution Power-Law Transforms, Log Transforms histogram processing
- **Transformations and Frequency Domain Filtering:** Image transforms - 1D-DFT, 2D-DFT, FFT, Ideal Low pass Filters Ideal Low pass Filters, Ideal High Pass filters
- **Image Compression:** fundamentals- redundancy, coding, inter pixel, Models, Elements of information theory, Error free compression- variable length, bit plane,. Fundamentals of JPEG Compression.
- **Image Restoration:** Filtering in spatial Domain, Salt and Pepper Noise, Image restoration and Degradation model -mean filter, median filter, alpha-trimmed filter. Geometric transformations. Fundamentals of Color image processing: color models - RGB, CMY, YIQ.
- **Image Segmentation:** Detection of discontinuities - point, line and edge and combined detection, Edge linking and boundary detection.

List of Topics for Laboratory:

- Introduction to Sherlock, Inspect and Spera and MATLAB Software and Camera installation settings, camera adjustments, how to capture image
- Neighborhood pixels processing.
- Image types, read, write and display image.
- Implementation of Image Add, Sub, Neg, Resize, Thresholding.
- Histogram Equalization of an Image.
- Implementation of Log transforms, Power transforms of an Image.
- Understanding FFT, DCT Filters and using FFT for implementing filters
- Detecting Circles, faults in given image using Sherlock Software.
- Implementation of image compression
- Detecting Edges and faults in a given sequence of images using Sherlock
- Salt and pepper noise Addition and image Reconstruction using median filter