

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Semester: III

M.E. Information Technology

Subject Name: **Speech and Image processing (Major Elective – IV)**

Sr.No	Course content
1.	Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling, Quantization, Relationship between pixels, distance measures, connectivity , Image Geometry, Photographic film. Histogram: Definition, decision of contrast basing on histogram, operations basing on histograms like image stretching, image sliding, Image classification. Definition and Algorithm of Histogram equalization.
2.	Image Transforms: A detail discussion on Fourier Transform, DFT,FFT, properties A brief discussion on WALSH Transform , WFT, HADAMARD Transform, DCT.
3.	Image Enhancement: (by SPATIAL Domain Methods) a. Arithmetic and logical operations, pixel or point operations, size operations, b. Smoothing filters-Mean, Median, Mode filters – Comparative study c. Edge enhancement filters – Directorial filters, Sobel, Laplacian, Robert, KIRSCH Homogeneity & DIFF Filters, prewitt filter, Contrast Based edge enhancement techniques. – Comparative study d. Low Pass filters, High Pass filters, sharpening filters. – Comparative Study e. Comparative study of all filters f. Color image processing.
4.	Image enhancement : (By FREQUENCY Domain Methods) Design of Low pass, High pass, EDGE Enhancement, smoothening filters in Frequency Domain. Butter worth filter, Homomorphic filters in Frequency Domain Advantages of filters in frequency domain, comparative study of filters in frequency domain and spatial domain.
5.	Image compression: Definition, A brief discussion on – Run length encoding, contour coding, Huffman code, compression due to change in domain, compression due to quantization Compression at the time of image transmission. Brief discussion on:- Image Compression standards.
6.	Image Segmentation: Definition, characteristics of segmentation. Detection of Discontinuities, Thresholding Pixel based segmentation method. Region based segmentation methods – segmentation by pixel aggregation, segmentation by sub region aggregation, histogram based segmentation, spilt and merge technique. Use of motion in segmentation (spatial domain technique only)

7.	Morphology: Dilation, Erosion, Opening, closing, Hit-and-Miss transform, Boundary extraction, Region filling, connected components, thinning, Thickening, skeletons , Pruning Extensions to Gray – Scale Images Application of Morphology in I.P
8.	Speech and Natural Language Processing: Introduction; Brief Review of Regular Expressions and Automata; Finite State Transducers; Word level Morphology and Computational Phonology; Basic Text to Speech; Introduction to HMMs and Speech Recognition. Indian language case studies; Part of Speech Tagging; Parsing with CFGs; Probabilistic Parsing. Representation of Meaning; Semantic Analysis; Lexical Semantics; Word Sense; Disambiguation; Discourse understanding; Natural Language Generation; Techniques of Machine Translation; Indian Language case studies.

Reference Books:

1. Digital Image Processing , by Rafael C. Gonzalez and Richard E. Woods Addison Wesley
2. Fundamentals of Electronic Image Processing by Arthyr –R – Weeks, Jr. (PHI)
3. Image processing, Analysis, and Machine vision by Milan Sonka vaclan Halavac Roger Boyle, Vikas Publishing House.