Subject Code	Subject Name	Credits
26CS616	PATTERN RECOGNITION AND IMAGE ANALYSIS	4

Course Objectives

1. To understand Pattern Recognition and Image Analysis
2. To learn about supervised and unsupervised algorithms
3. To understand Image Segmentation and Edge Detection

Learning Outcomes

After the completion of the course, the graduate will be able to

1. To learn about pattern recognition and the various concepts associated with it.

Unit 1 - Introduction Pattern Recognition and Image Analysis (12 Hrs.)

Machine perception, pattern recognition example, pattern Recognition systems, the design cycle, learning and adaptation - Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification-zero–one loss function, classifiers, discriminant functions, and decision surfaces.

Unit 2 - Normal density (12 Hrs.)

Univariate and multivariate density, discriminant functions for the normal density-different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

Unit 3 - Un- supervised learning and clustering (12 Hrs.)

Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Date description and clustering – similarity measures, criteria function for clustering - Pattern recognition using discrete hidden Markov models - Discrete-time Markov process, Extensions to hidden Markov models, three basic problems of HMMs, types of HMMs.

Unit 4 - Continuous hidden Markov models (12 Hrs.)

Continuous observation densities, multiple mixtures per state, speech recognition applications - Digital image models, sampling and quantization, basic relationships between pixels, image geometry. Image enhancement: Back ground, enhancement by point processing histogram processing, spatial filtering, introduction to image transforms, image enhancement in frequency domain.

Unit 5 - Image Segmentation and Edge Detection (12 Hrs.)

Region Operations, Crack Edge Detection, Edge Following, Gradient operators, Compass and Laplace operators. Threshold detection methods, optimal thresholding, multispectral thresholding, thresholding in hierarchical data structures; edge based image segmentation- edge image thresholding, edge relaxation, border tracing, border detection, image morphology, image security.

References:

1. Richard O. Duda, Peter E. Hart, David G. Stroke, Pattern Classifications, Wiley.
2. Lawrence Rabiner, Biing – Hwang Juang Fundamentals of Speech Recognition, Pearson
3. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Pearson Education.