CA5T3G	PATTERN RECOGNITION	Credits : 4

Lecture Hours : 4 periods / week

Internal assessment : 30   Marks
Semester and Examination: 70   Marks

Course Description:

Pattern recognition deals with automated classification, identification, and characterizations of unknown systems. Virtually unlimited number of applications can benefit from pattern recognition techniques. Although it employs elegant and sophisticated mathematical and statistical analysis techniques, pattern recognition is nevertheless a very application driven field. Identification of pathological disorders from various biological indicators, hand written character recognition, finger print analysis, face recognition, iris scan based recognition, financial data predictions, or automated determination of whether one should get a credit card based on his/her past credit history are just a few of such applications that call for pattern recognition techniques.

Course Objective:
- Student will learn the appropriate feature of Pattern recognition.
- Student will understand the Bayesian Decision Theory and its density.
- Student will understand the Maximum Likelihood & Parameter Estimation.
- Student able to understand Dimensionality Reduction**.**
- Student able to Process of Unsupervised Learning and Clustering.
- Able to learn various applications of Pattern Recognition.

UNIT I:
Introduction: Machine Perception, Pattern Recognition Systems, The Design Cycle, Learning and Adaptation, Pattern Recognition Approaches.

UNIT II:
Bayesian Decision Theory: Introduction, Bayesian Decision Theory-Continuous Features, Minimum Error Rate Classification, Classifiers, Discriminate Functions and Decision Surfaces.

UNIT III:
Bayesian Decision Theory-Density Models: The normal Density, Discriminant Functions for Normal Density, Error Bounds, Discrete Features, Missing and Noisy Features, Bayesian Belief Networks.

UNIT IV:
Maximum Likelihood & Parameter Estimation: Introduction, Maximum likelihood estimation, Bayesian estimation, Bayesian parameter estimation.

UNIT V:
Dimensionality Reduction: Component Analysis- Principal Component Analysis(PCA), Non-Linear Component Analysis(NLCA),Independent Component Analysis (ICA), Linear Discriminant Functions, Fisher Linear Discriminant, Self Organizing Maps(SOM).

UNIT VI:
Unsupervised Learning and Clustering: Introduction, Mixture Densities and Identifiability, Maximum-likelihood estimates, Application to normal Mixtures, K-Means of Clustering, Data Description and clustering, Criterion Functions for Clustering.

UNIT VII:

Statistical learning: Introduction, Expectation Maximization (EM), Linear Vector quantization (LVQ), Hidden Markov Models(HMM).

UNIT VIII:

Applications of Pattern Recognition: Introduction, Learning through Supervised Approach, Unsupervised Approach.

Learning Resources :

Text Books:

1. Pattern Classification, Richard O.Duda, Peter E. Hart,David G.Stork,Wiley Student Edition, 2/e, 2000.

Reference Books:

1. Pattern Recognition Statistical, Structural and Neural Approaches, Robert Schalkoff, Wiley Student Edition, 2007.
2. Pattern Recognition – Concepts, Methods and Applications, J. P. Marques De Sa, Springer, 1/e, 2008,