MCAE214: PATTERN RECOGNITION

Hours/Week: 3	I.A. Marks: 30
Credits: 3	Exam. Marks: 70

Course Learning objectives: Students will try,

1. Understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms

2. Understand the basic methods of feature extraction, feature evaluation, and data mining

3. Understand and apply both supervised and unsupervised classification methods
4. To detect and characterize patterns in real-world data.

Course Outcomes: After completing the course, the students will be able to,

CO1: Design and implement machine learning solutions to classification, regression,and clustering .

CO2: Evaluate and interpret the results of the algorithms.

CO3: Search, collect, classify and critically interpret relevant information to design a simple pattern recognition systems

CO4: Describe and explain a pattern recognition algorithm that utilizes supervised learning and unsupervised learning

CO5: Gain knowledge about state-of-the-art algorithms used in pattern recognition research.

CO6: Apply pattern recognition techniques in practical problems.

C07: Realize the importance of the various feature selection algorithms usages.

UNIT-I 9 Hrs.

Pattern Recognition Systems – Definitions, data representation, representations of patterns and classes. Types of pattern recognition systems. Applications of pattern recognition systems. Bayesian decision making and Bayes Classifier for continuous and discrete features.

UNIT-II 9 Hrs.

Min-max and Neymann-Pearson classifiers, Discriminant functions, decision surfaces. Maximum likelihood estimation and Bayesian parameter estimation. Overview of Nonparametric density estimation – Histogram based approach, classification using Parzen window.

UNIT-III 9 Hrs.

K-nearest neighbour Estimation and Classification. Classification of Clustering Algorithms – Hierarchical Clustering – Agglomerative Clustering. Partitional Clustering – Forgy's algorithm, K-means Clustering.

UNIT-IV 9 Hrs.

Introduction to Feature Selection – Filter Method – Sequential Forward and Backward Selection Algorithms. Wrappers Method and Embedded Methods. Feature Extraction Methods – Principal Component Analysis, Fisher Linear Discriminant Analysis, ICA.

REFERENCE BOOKS:

1. R. J. Schalkoff, Pattern Recognition: Statistical, Structural and Neural approaches, Wiley Student Edn, 1992.
2. Tou and Gonzalez, Pattern Recognition Principles, Addison Wesley, 1974.
3. Duda, Hart and Stork, Pattern Classification, 2ndEdn, John Wiley and Sons
4. Morton Nadler, Eric P Smith, Pattern Recognition Engineering, Wiley, 1993.
5. Duda R.O., Hart P.E., Stork D.G., Pattern Classification, John Wiley and Sons, 2nd Edition, 2001
6. Bishop C.M., Pattern Recognition and Machine Learning, Springer, 2nd Edition, 2006
7. Theodoridis S., Pikrakis A., Koutroumbas K., Cavouras D., Introduction to Pattern Recognition: A MATLAB approach, Academic Press, 2010.