# CSE 101E1: Pattern Recognition

## Course Outcomes (CO):

i.    Understand the basics and fundamentals of statistical techniques commonly used in pattern recognition problem.
ii.   Understand the concepts of machine learning and deep learning techniques and various real world problems that can be handled by learning algorithms/ techniques.
iii.  Compare and contrast different pattern recognition algorithms.
iv.   Apply the concepts of machine learning and deep learning algorithms in real life problems.
v.    Understand the concepts of decision making and modelling as a problem solving approach.

## Syllabus:

**Introduction** to pattern recognition and learning (supervised, unsupervised), training and test sets, feature selection.

**Supervised learning and classification:** Discriminant functions and decision boundaries Linear discriminant functions, relaxation procedure, non-separable behaviour Minimum distance classifier. Bayesian decision theory.Maximum likelihood classification. Parameter estimation, sufficient statistics, component analysis and discriminants (PCA, Fisher's) Nonparametric techniques. Density estimation, Parzen window, K-NN estimation, Decision Tree, SVM.

**Unsupervised learning and clustering:** Data description and clustering –similarity measures, criterion for clustering, Methods of clustering – partitional: KMean, KMode, KMedian, FCN, hierarchical, graph theoretic, density based, Cluster validity

**Feature extraction and feature selection:** Problems of dimensionality- Feature extraction --PCA-Feature selection –KarhunenLoeve, stochastic approximation, kernel approximation, divergence measures

## References:
1. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification and Scene Analysis, 2nd ed., Wiley, New York, 2000.
2. J. T. Tou and R. C. Gonzalez, Pattern Recognition Principles, Addison-Wesley, London, 1974.