PATTERN RECOGNITION AND APPLICATION

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INTENDED AUDIENCE : Any Interested Learner

COURSE OUTLINE :

The course has been designed to be offered as an elective to final year under graduate students mainly from Electrical Sciences background. The course syllabus assumes basic knowledge of Signal Processing, Probability Theory and Graph Theory. The course will also be of interest to researchers working in the areas of Machine Vision, Speech Recognition, Speaker Identification, Process Identification etc. The course covers feature extraction techniques and representation of patterns in feature space. Measure of similarity between two patterns. Statistical, nonparametric and neural network techniques for pattern recognition have been discussed in this course. Techniques for recognition of time varying patterns have also been covered. Numerous examples from machine vision, speech recognition and movement recognition have been discussed as applications. Unsupervised classification or clustering techniques have also been addressed in this course. Analytical aspects have been adequately stressed so that on completion of the course the students can apply the concepts learnt in real life problems.

ABOUT INSTRUCTOR :

Prof. Prabir Kr. Biswas completed his B.Tech(Hons), M.Tech and Ph.D from the Department of Electronics and Electrical Communication Engineering, IIT Kharagpur, India in the year 1985, 1989 and 1991 respectively. From 1985 to 1987 he was with Bharat Electronics Ltd. Ghaziabad as a deputy engineer. Since 1991 he has been working as a faculty member in the department of Electronics and Electrical Communication Engineering, IIT Kharagpur, where he is currently holding the position of Professor and Head of the Department. Prof. Biswas visited University of Kaiserslautern, Germany under the Alexander von Humboldt Research Fellowship during March 2002 to February 2003. Prof. Biswas has more than a hundred research publications in international and national journals and conferences and has filed seven international patents. His area of interest are image processing, pattern recognition, computer vision, video compression, parallel and distributed processing and computer networks. He is a senior member of IEEE and was the chairman of the IEEE Kharagpur Section, 2008.

COURSE PLAN :

Week 1 :
- Introduction
- Feature Extraction - I
- Feature Extraction - II

Week 2 :
- Bayes Decision Theory - I
- Bayes Decision Theory - II

Week 3 :
- Normal Density and Discriminant Function - I
- Normal Density and Discriminant Function - II
- Bayes Decision Theory - Binary Features

Week 4 :
- Maximum Likelihood Estimation
- Probability Density Estimation - I

Week 5 :
- Probability Density Estimation - II
- Probability Density Estimation - III
- Probability Density Estimation - IV

Week 6 :
- Dimensionality Problem
- Multiple Discriminant Analysis

Week 7 :
- Principal Component Analysis - Tutorial
- Multiple Discriminant Analysis - Tutorial
- Perceptron Criteria - I

Week 8 :
- Perceptron Criteria - II
- MSE Criteria

Week 9 :
- Linear Discriminator Tutorial
- Neural Network - I
- Neural Network - II

Week 10 :
- Neural Network -III/ Hopefield Network
- RBF Neural Network - I

Week 11 :
- RBF Neural Network - II
- Support Vector Machine
- Clustering -I

Week 12 :
- Clustering -II
- Clustering -III