UNIT – 8 **7 Hours**

Unsupervised Learning and Clustering: Introduction; Mixture Densities and Identifiability; Maximum-Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Description and Clustering; Criterion Functions for Clustering.

Text Books:

1. Richard O. Duda, Peter E. Hart, and David G.Stork: Pattern Classification, 2nd Edition, Wiley-Interscience, 2001.

Reference Books:

1. Earl Gose, Richard Johnsonbaugh, Steve Jost: Pattern Recognition and Image Analysis, PHI, Indian Reprint 2008.

STOCHASTIC MODELS AND APPLICATIONS

Subject Code: 10CS665	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART – A

UNIT – 1 **6 Hours**

Introduction – 1: Axioms of probability; Conditional probability and independence; Random variables; Expected value and variance; Moment-Generating Functions and Laplace Transforms; conditional expectation; Exponential random variables.

UNIT – 2 **6 Hours**

Introduction – 2: Limit theorems; Examples: A random graph; The Quicksort and Find algorithms; A self-organizing list model; Random permutations.

UNIT – 3 **7 Hours**

Probability Bounds, Approximations, and Computations: Tail probability inequalities; The second moment and conditional expectation inequality; probability bounds via the Importance sampling identity; Poisson random variables and the Poisson paradigm; Compound Poisson random variables.

UNIT – 4 **7 Hours**

Markov Chains: Introduction; Chapman-Kologorov Equations; Classification of states; Limiting and stationary probabilities; some

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applications; Time-Reversible Markov Chains; Markov Chain Monte Carlo methods.

PART – B

UNIT – 5 **6 Hours**

The Probabilistic Method: Introduction; Using probability to prove existence; Obtaining bounds from expectations; The maximum weighted independent set problem: A bound and a ranom algorithm; The set covering problem; Antichains; The Lovasz Local lemma; A random algorithm for finding the minimal cut in a graph.

UNIT – 6 **6 Hours**

Martingales: Martingales: Definitions and examples; The martingale stopping theorem; The Hoeffding-Azuma inequality; Sub-martingales.

UNIT – 7 **7 Hours**

Poisson Processes, Queuing Theory – 1: The non-stationary Poisson process; The stationary Poisson process; Some Poisson process computations; Classifying the events of a non-stationary Poisson process; Conditional distribution of the arrival times

Queuing Theory: Introduction; Preliminaries; Exponential models

UNIT – 8 **7 Hours**

Queuing Theory – 2: Birth-and-Death exponential queuing systems; The backwards approach in exponential queues; A closed queuing network; An open queuing network; The M/G/1 queue; Priority queues.

Text Books:

1. Sheldon M. Ross: Probability Models for Computer Science, Elsevier, 2002.

Reference Books:

1. B. R. Bhat: Stochastic Models Analysis and Applications, New Age International, 2000.
2. Scott L. Miller, Donald G. Childers: Probability and Random Processes with Applications to Signal Processing and Communications, Elsevier, 2004.

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