

**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, 2<sup>nd</sup> 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-Kolmogorov 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 random 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**

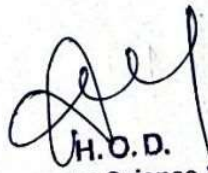
**Queuing Theory – 2:** Birth-and-Death exponential queuing systems; The backwards approach in exponential queues; A closed queuing network; An open queuing network; The M/G/1 queue; Priority queues.

#### **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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