

MSE1005 PROBABILITY AND STATISTICAL ANALYSIS

Module 1

Probability Theory: Random Experiment Mathematical or Apriori Definition of Probability, Statistical or Aposteriori Definition of Probability, Axiomatic Definition of Probability, Conditional Probability Independent Events, Theorem of Total Probability, Baye's Theorem or Theorem of Probability of Causes, Bernoulli's Trails De Moivre-Laplace Approximation, Generalisation of Bernoulli's Theorem Multinomial Distribution.

Module 2

Random Variables: Discrete Random Variable, Probability Function, Continuous Random Variable, Probability Density Function Cumulative Distribution Function, (cdf), Properties of the cdf $F(x)$, Special Distributions, Discrete Distributions, Continuous Distributions, Two-Dimensional Random Variables, Probability Function of (x, y) , Joint Probability Density Function, Cumulative Distribution Function, Properties of $F(x, y)$, Marginal Probability Distribution, Conditional Probability Distribution, Independent RVs, Random Vectors, Marginal Probability Distribution of $X \{i, p_i^*\}$, Marginal Probability Distribution of $Y: \{j, p_j^*\}$.

Module 3

Functions of Random Variables: Function of One Random Variable, One Function of Two Random Variables, Two Functions of Two Random Variables, Statistical Averages Expected Values of a Two-Dimensional RV, Properties of Expected Values, Covariance and Correlation, Properties, Conditional Expected Values, Characteristic functions, Properties of MGF, Properties of Characteristic Function, Cumulant Generating Function (CGF), Joint Characteristic Function (CGF).

Module 4

Special Probability Distributions: Introduction, Special Discrete Distributions - Binomial, Poisson, Geometric and Hyper geometric Distributions and their Properties (mean, Variance etc) Special Continuous Distributions- Uniform, Exponential, Erlang and Normal Distributions and their Properties.

Module 5

Tests of Hypotheses: Parameters and Statistics, Sampling Distribution, Estimation and Testing of Hypotheses, Tests of significance, errors, Tailed Tests, critical values, Student's T- Distribution, Snedecor's F- Distribution and Chi-square Distribution and their uses and Properties.

Module 6

Random Processes: Classification of Random Processes, Methods of Description of a Random Process, Special Classes of Random Processes, Average Values of Random Processes, Stationarity, Example of a SSS Process, Analytical Representation of a Random Process, Autocorrelation Function and its Properties of $R(t)$,

Module 7

Special Random Processes: Definition of Gaussian Process, Properties, Processes Depending on Stationary Gaussian Process, Poisson Process, Probability Law for the Poisson Process $\{X(t)\}$, Second – Order Probability Function of a Homogeneous, Poisson Process, Mean and Autocorrelation of the Poisson Process, Properties of Poisson Process, Markov Process, Definition of a Markov Chain, Chapman – Kolmogorov Theorem, Classification of States of a Markov Chain

Reliability Engineering: Concepts of Reliability, Reliability of Systems, Maintainability and Availability.

Text Book:

T. Veerarajan – Probability, Statistical, Random Processes 2nd Ed., TMH, New Delhi, 2003.

Reference Books:

1. A. Papoulis & S.V. Pillai – Probability, random Variables and Stochastic Processes, 4th Ed., TMH, New Delhi.
2. S.M. Ross- Probability Models, 6th Ed. Harcourt Asia Pte Ltd, New Delhi, 2000.

1. R.V. Hogg and A.T. Craig – Introduction to Mathematical Statistics, 5th Ed, Pearson Education, New Delhi, 2004.
2. J.E. Freund and R.E. Walpole, Mathematical Statistics, 5th Ed., PHI, New Delhi, 2000.