

# AMCS-01 ADVANCE ENGINEERING MATHEMATICS

## UNIT-1 PROBABILITY

- 1.1 Random Experiment;
- 1.2 Sample space; Random Events;
- 1.3 Probability of events.
- 1.4 Axiomatic definition of probability;
- 1.5 Frequency Definition of probability;
- 1.6 Finite sample spaces and equiprobable measure as special cases;
- 1.7 Probability of Non-disjoint events (Theorems).
- 1.8 Counting techniques applied to probability problems;
- 1.9 Conditional probability;
- 1.10 General Multiplication Theorem;
- 1.11 Independent events; Bayes' theorem and related problems.

## UNIT-2 RANDOM VARIABLES (DISCRETE AND CONTINUOUS)

- 2.1 Probability mass function;
- 2.2 Probability density function and distribution function.
- 2.3 Distributions: Binomial, Poisson, Uniform, Exponential, Normal, t and  $\chi^2$ .
- 2.4 Expectation and Variance (t and  $\chi^2$  excluded);
- 2.5 Moment generating function;
- 2.6 Reproductive Property of Binomial;
- 2.7 Poisson and Normal Distribution (proof not required).
- 2.8 Transformation of random variables (One variable);
- 2.9 Chebychev inequality (statement) and problems.

## UNIT-3 BINOMIAL

- 3.1 Binomial approximation to Poisson distribution and Binomial approximation to Normal distribution (statement only);
- 3.2 Central Limit Theorem (statement);
- 3.3 Law of large numbers (Weak law);
- 3.4 Simple applications.

## UNIT-4 STATISTICS

- 4.1 Population; Sample; Statistic;
- 4.2 Estimation of parameters (consistent and unbiased);
- 4.3 Sampling distribution of sample mean and sample variance (proof not required).
- 4.4 Point estimate: Maximum likelihood estimate of statistical parameters (Binomial, Poisson and Normal distribution).
- 4.5 Interval estimation.

## UNIT-5 TESTING OF HYPOTHESIS

- 5.1 Simple and Composite hypothesis;

- 5.2 Critical Region;
- 5.3 Level of Significance; Type I and Type II Errors;
- 5.4 Best Critical Region; Neyman-Pearson Theorem (proof not required);
- 5.5 Application to Normal Population;
- 5.6 Likelihood Ratio Test (proof not required);
- 5.7 Comparison of Binomial Populations;
- 5.8 Normal Populations;
- 5.9 Testing of Equality of Means;  $\chi^2$ —Test of Goodness of Fit (application only).

#### **UNIT-6 SIMPLE IDEA OF BIVARIATE DISTRIBUTION**

- 6.1 Correlation and Regression; and simple problems.

#### **Reference Books:**

1. Conditional Independence in Applied Probability” by P Pfeiffer
2. Probability and computing: Randomized Algorithms and Probabilistic Analysis” by Mitzenmacher and E Upfal
3. Introduction to Probability” by D Bertsekas and J Tsitsiklis
4. Probability, Random Variables, and Random Processes” by John J Shynk

