MA 202: PROBABILITY AND STATISTICS (3-0-0: 3)

Discrete Probability

- Randomness, finite probability space, probability measure, events
- Conditional probability, independence, Bayes' theorem
- Discrete random variables
- Binomial, Poisson, geometric distributions
- Mean and variance: concepts, significance, computations, applications
- Integer random variables

Continuous Probability

- Continuous random variables, the nature of these, illustrations of use
- Exponential, Gamma and normal distribution: probability density functions, calculation of mean and variance
- The central limit theorem and the implications for the normal distribution
- Joint distribution
- Distributions of sums of random variables

Expectation

- Moments, transform methods,
- Conditional expectation, examples
- Imperfect fault coverage and reliability

Sampling Distributions

- Purpose and the nature of sampling, its uses and applications
- Data analysis, tools; graphical and numerical summaries
- Distributions of the sample mean and the sample variance for a normal population, Chi-squared, t and F-distributions
- Multivariate distributions, independent random variables

Estimation

- Nature of estimates: point estimates, interval estimates
- Criteria to be applied to single point estimators: unbiased estimators, consistent estimators, efficiency of estimators
- Method of moments and maximum likelihood principle approach, least squares approach; applicability conditions
- Confidence intervals for parameters in one sample and two sample problems of normal populations

Hypothesis Tests

- Development of models and associated hypotheses, the nature of these
- Hypothesis formulation: null and alternate hypotheses
- Testing hypothesis based on a single parameter, choice of test statistic; choice of samples and distributions
- Criteria for acceptance of hypothesis
- t-test, Chi-squared test; applicability criteria for these

Correlation and Regression

- The nature of correlation and regression, definitions
- Definition and calculation of correlation coefficients

- Approaches to correlation: the linear model approach, the least squares fitting approach, strengths and weaknesses of these and conditions for applicability

Text Books

1. S.M. Ross, “Introduction to Probability and Statistics for Engineers and Scientists’’, Academic Press
2. W.W. Hines, D.C. Montgomery, D.M. Goldsman and C.M. Borror, “Probability and Statistics in Engineering’’, Wiley India Pvt. Ltd.

Reference Books

1. V.K. Rohatgi and A. K. Saleh, “An Introduction to Probability and Statistics”, Wiley India Pvt. Ltd.
2. J. S Milton and J.C. Arnold, “Introduction to Probability and Statistics”, Tata McGraw-Hill
3. R.V. Hogg, J.W. McKean, and A.T. Craig, “Introduction to Mathematical Statistics”, Pearson Education
4. H. Frank and S.C. Altheon, “Statistics: Concepts and Applications”, Cambridge University Press