Skill Enhancement Course 2

Course Code: 2MTMSEC1 (Credit: 3, Hours: 45; Full Marks: 75)

Course Name: Probability and Statistics

Course Outcome: In this course, students will learn about measures of central tendency, dispersion, skewness, and kurtosis, enabling them to analyze and interpret data. They will also study bivariate data analysis to understand relationships between variables. Additionally, the course covers random variables, various probability distributions, and inequalities. This knowledge is essential in pure and applied mathematics courses, providing students with the foundational skills necessary for statistical analysis, probability modelling, and further studies in mathematical fields.

Course Content:

1. Fundamental axioms: Statistical regularity, frequency interpretation, Axioms of Probability, conditional probabilities, Bayes's theorem, independent events.
2. Random Variables: Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function, characteristic functions.
3. Special Distributions: Binomial, Poisson and Normal distributions.
4. Joint Distributions: correlation, regression
5. Measure of central tendency, dispersion, skewness and kurtosis.
6. The Central Limit Theorem (statement only).
7. Sampling Distributions: Distributions of the sample mean and the sample variance for a normal population, definition and basic properties of Chi-Square, t and F distributions.
8. Estimation: the method of moments and the method of maximum likelihood estimation, confidence intervals for the mean(s) and variance(s) of normal populations. (Problems only)
9. Testing of Hypotheses: Null and alternative hypotheses, the critical and acceptance regions, two types of error, basic concepts of testing. (Problems only)

References:

1. Robert V. Hogg, Joseph W. McKean and Allen T. Craig, Introduction to Mathematical Statistics, Pearson Education, Asia, 2007.
2. Irwin Miller and Marylees Miller, John E. Freund, Mathematical Statistics with Applications,
3. Sheldon Ross, Introduction to Probability Models,
4. Alexander M. Mood, Franklin A. Graybill and Duane C. Boes, Introduction to the Theory of Statistics.
5. Statistical Methods, N. G. Das
6. Groundwork of Mathematical Probability and Statistics- Amritava Gupta
7. Fundamentals of Statistics (Vol 1)- Gun, Gupta and Dasgupta
8. Mathematical Statistics- Kapoor and Saxena