PROBABILITY AND STATISTICS (3-0-0)

Course Objectives

- To introduce students to fundamental concepts of probability.
- To develop statistical thinking for data analysis.
- To apply probability distributions in computing contexts.
- To provide a foundation for advanced studies in data science, AI, and analytics.

Course Outcomes (COs)

CO1: Understand and apply probability rules and concepts.
CO2: Work with discrete and continuous probability distributions.
CO3: Compute and interpret descriptive statistical measures.
CO4: Perform basic statistical inference and hypothesis testing.
CO5: Analyze relationships using correlation and regression.

Module - I: Descriptive Statistics (9 Classes)

- Types of data and measurement scales
- Frequency distribution and tabulation
- Graphical representation (Histogram, Bar diagram, Pie chart)
- Measures of central tendency (Mean, Median, Mode)
- Measures of dispersion (Range, Variance, Standard Deviation)
- Skewness (introductory concept)

Module - II: Probability Theory (11 Classes)

- Random experiments, sample space, and events
- Probability definitions (classical and empirical)
- Addition and multiplication theorems
- Conditional probability
- Bayes' Theorem
- Independent events

Module - III: Random Variables and Probability Distributions (12 Classes)

Discrete Random Variables:

- PMF, Expectation, Variance
- Binomial distribution
- Poisson distribution

Continuous Random Variables:

- PDF, Expectation
- Uniform distribution
- Normal distribution

Module - IV: Statistical Inference, Correlation and Regression (8 Classes)

- Population vs Sample
- Sampling techniques
- Estimation (point and interval)
- Confidence interval (mean, basic idea)
- Hypothesis testing (concept, errors, t-test introduction)
- Covariance and Correlation
- Simple Linear Regression

Suggested Textbooks

1. S.C. Gupta & V.K. Kapoor – Fundamentals of Mathematical Statistics, Sultan chand & sons, 10th edition
2. Sheldon Ross – A First Course in Probability, 8th edition, Pearson
3. Ronald E. Walpole, H. Myers , L. Myers , Keying Ye – Probability & Statistics for Engineers & Scientists, 9th edition, PHI