

Teaching Plan: B.A. (Prog.) /B.Sc. (Physical Sc.) with Mathematics, Semester-6

Discipline A-6: Probability and Statistics

Weeks 1 and 2: Descriptive statistics: Populations, Samples, Stem-and-leaf displays, Dotplots, Histograms, Qualitative data, Measures of location, Measures of variability, Boxplots. [1]: Chapter 1.

Weeks 3 and 4: Sample spaces and events, Probability axioms and properties, Conditional probability, Bayes' theorem and independent events. [1]: Chapter 2.

Weeks 5 and 6: Discrete random variables and probability distributions, Expected values; Probability distributions with their mean and variance: Binomial, geometric, hypergeometric, negative binomial, Poisson, and Poisson distribution as a limit. [1]: Chapter 3.

Weeks 7 and 8: Continuous random variables, Probability density functions, Uniform distribution, Cumulative distribution functions and expected values. [1]: Chapter 4 (Sections 4.1, and 4.2).

Weeks 9 and 10: Normal and standard normal distributions with their percentiles, Approximating the binomial distribution; Exponential distribution, Lognormal distribution.
[1]: Chapter 4 [Sections 4.3, 4.4 (up to Example 4.22 page 172), and 4.5 (Definition page 179 to Example 4.27)].

Weeks 11 and 12: Sampling distribution and standard error of the sample mean, Central Limit Theorem and applications. [1]: Chapter 5 (Section 5.4).

Weeks 13 to 15: Scatterplot of bivariate data, Regression line using principle of least squares (statement with normal equations), Predicted values and the residuals, Error sum of squares, Coefficient of determination, The sample correlation coefficient and properties.
[1]: Chapter 12 [Sections 12.1 (up to Example 12.2), 12.2, and 12.5 (up to page number 529)].

Reference:

1. Devore, Jay L. (2016). *Probability and Statistics for Engineering and the Sciences* (9th ed.). Cengage Learning India Private Limited. Delhi. Indian Reprint 2020.

Practical component - Software labs using Microsoft Excel or any other spreadsheet.

1. Presentation and analysis of data (univariate and bivariate) by frequency tables, descriptive statistics, stem-and-leaf plots, dotplots, histograms, boxplots, comparative boxplots, and probability plots ([1] Section 4.6).
2. Fitting of binomial, Poisson, and normal distributions.
3. Illustrating the Central Limit Theorem through Excel.
4. Fitting of regression line using the principle of least squares.
5. Computation of sample correlation coefficient.