

Probability and Statistics (STA-103)
Tribhuvan University
Soch College of Information Technology
Bachelor of Science in Computer Science and Information Technology

Course Title: Probability and Statistics

Course no: STA-103 ----- Full Marks: 60+20+20

Credit hours: 3 ----- Pass Marks: 24+8+8

Nature of course: Theory (3 Hrs.) + Lab (3 Hrs.)

Course Synopsis: Concept of descriptive statistics, probability, probability distributions, inferential statistics and their applications.

Goal: This course enhances the ability of students in computing and understanding summary statistics; understanding the concept of probability and probability distributions with their applications in statistics. Finally, students will develop their ability of using inferential statistics in decision-making processes.

Course Contents:

Unit 1. Introduction ----- 2 Hrs.

Scopes and limitations of statistics in empirical research; Role of probability theory in statistics; Role of computer technology in statistics

Unit 2. Descriptive Statistics ----- 6 Hrs.

Measures of location: mean, median, mode, partition values and their properties; Measures of dispersion: absolute and relative measure of variation; range, quartile deviation, standard deviation; Other measures: Coefficient of variation; Measures of skewness and kurtosis.

Unit 3. Probability ----- 5 Hrs.

Introduction of probability: Basic terminology in probability: sample space, events, random experiment, trial, mutually exclusive events, equally likely events, independent events; Definitions of probability: Classical, statistical, axiomatic definitions; Basic principles of counting; Laws of probability: Additive and multiplicative; Conditional probability; Bayes' Theorem.

Unit 4. Random Variable and Expectation ----- 2 Hrs.

Random Variables: Discrete and continuous random Variables; Probability distribution of random variables; Expected value of discrete & continuous random Variable.

Unit 5. Jointly Distributed Random Variables and Probability Distributions ----- 4 Hrs.

Joint Probability Distribution of two random variables: Joint probability mass functions and density functions; Marginal probability mass and density functions; Mean, variance, covariance and correlation of random variables; Independent random variables; Illustrative numerical problems.

Unit 6. Discrete Probability Distributions ----- 5 Hrs.

Bernoulli and binomial random variable and their distributions and moments; Computing binomial probabilities; Fitting of binomial distribution; Poisson random variable and its distribution and moments; Computing Poisson probabilities; Fitting of Poisson distribution.

Unit 7. Continuous Probability Distributions ----- 6 Hrs. Normal distribution and its moments; Standardization of normally distributed random variable; Measurement of areas under the normal curve; Negative exponential distribution and its moments; Concept of hazard rate function.

Unit 8. Chi-square, t and F Distribution ----- 4 Hrs.

Characteristics function of normal random variable; Distribution of sum and mean of n independent normal random variables; Canonical definitions of chi-square, t and F random variables and their distributions; Joint distribution of \bar{X} and S^2 in case of normal distribution.

Unit 9. Inferential Statistics----- 7 Hrs.

Simple random sampling method and random sample; Sampling distribution and standard error; Distinction between descriptive and inferential statistics; General concept of point and interval estimation; Criteria for good estimator; Maximum likelihood method of estimation; Estimation of mean and variance in normal distribution; Estimation of proportion in binomial distribution; Confidential interval of mean in normal distribution; Concept of hypothesis testing; Level of significance and power of a test; Tests concerning the mean of a normal distribution case - when variance is known (Z -test) and unknown (t -test)

Unit 10. Correlation and Linear Regression ----- 4 Hrs.

Simple Correlation: Scatter diagram; Karl Pearson's correlation coefficient and its properties, Simple Linear Regression: Model and assumptions of simple linear regression; Least square estimators of regression coefficients; Tests of significance of regression coefficients; Coefficient of determination.

Text Books:

Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, 3rd Edition, India: Academic Press, 2005.

References:

Richard A. Johnson, Miller and Freund's probability and Statistics for Engineers, 6th Edition, Indian reprint: Pearson Education, 2001. Ronald E. Walpole, R.H. Myers, S.L. Myers, and K. Ye, Probability and Statistics for Engineers and Scientists, 7th Edition, Indian reprint: Pearson Education, 2005.