# Cover Page

# rse Structure

**23BS22T3 - STATISTICAL METHODS FOR DATA SCIENCE**

**(Common to CSE-DS and AI&DS)**

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| **Course Category:** | Basic Sciences | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Prerequisite:** | Intermediate Mathematics | **Sessional Evaluation:**  **Univ. Exam Evaluation:**  **Total Marks:** | 30  70  100 |
| **Objectives:** | * Statistical methods used in data science help to explore data and find patterns and trends, descriptive statistics summarize data using indexes like the mean and median. * It helps to understand the data by providing a clear overview and checking its quality | | |

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| **Course Outcomes** | **Upon successful completion of the course, the students will be able to:** | |
| CO1 | Understand the basic concepts of Statistics. |
| CO2 | Analyze the data and draw conclusion about collection of data under study using Point estimation |
| CO3 | Analyze data and draw conclusion about collection of data under study using Interval estimation. |
| CO4 | Analyze to test various hypotheses included in theory and types of errors for large samples. |
| CO5 | Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems. |
| **Course Content** | **UNIT-I**  **Basic Concepts:** Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Probability distributions: Binomial, Poisson and Normal-their properties. Population, sample, parameter and statistic, characteristics of a good estimator, Consistency – Invariance property of Consistent estimator, sufficient condition for consistency; Unbiasedness Sufficiency.  **UNIT-II**  **Point Estimation:** Point Estimation- Estimator, Estimate, Methods of point estimation – Maximum likelihood method (the asymptotic properties of ML estimators are not included), Large sample properties of ML estimator (without proof)- applications, Method of moments, method of least squares, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation and applications..  **UNIT-III**  **Interval Estimation:** Confidence limits and confidence coefficient; Duality between acceptance region of a test and a confidence interval; Construction of confidence intervals for population proportion (small and large samples) and between two population proportions(large samples) Confidence intervals for mean and variance of a normal population, Difference between the mean and ratio of two normal populations  **UNIT-IV**  **Testing of hypotheses:** Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Notion of Uniformly most powerful tests; Likelihood Ratio tests: Description and property of LR tests - Application to standard distributions.  **UNIT-V**  **Small sample tests:** Student’s t-test, test for a population mean, equality of two population means, paired t-test, F- test for equality of two population variances, Chi-square test for goodness of fit and test for independence of attributes, χ2 test for testing variance of a normal distribution. | |
| **Text Books**  **&**  **References**  **Books** | **TEXT BOOKS:**  1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.  2. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of  Hypotheses, Prentice Hall of India, 2014  **REFERENCE BOOKS:**  1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan  Chand & Sons Publications, 2012.  2. S. Ross, a First Course in Probability, Pearson Education India, 2002.  3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley,  1968.  4. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical  Inference, 9th edition, Pearson publishers,2013. | |
| **E-Resources** | 1. https://onlinecourses.nptel.ac.in/noc21\_ma74/preview  2. https://onlinecourses.nptel.ac.in/noc22\_mg31/preview | |