GUJARAT TECHNOLOGICAL UNIVERSITY
MASTER OF COMPUTER APPLICATION
SEMESTER: III

Subject Name: **Statistical Methods(SM)**
Subject Code: **630003**

Objectives:

- To develop the ability to compute descriptive statistics including diagrammatic representation and interpretation
- To understand the concept of probability and probability distributions
- To develop the ability to carry out testing of hypothesis on a population based on statistical measures of samples
- To be able to carry out simple linear regression analysis
- To understand time series analysis and its application to forecasting
- To introduce the concept of non-parametric methods useful particularly for nominal or ordinal data

Prerequisites: None

Contents:

Unit-1: Descriptive Statistics and Correlation **(15%)**

- Introduction to Statistics;
- Applications in Business & Economics; Data: Summarizing Qualitative & Quantitative Data.
- Exploratory Data Analysis: The Stem-and-leaf Display; Cross Tabulation & Scatter Diagrams;
- Measures of location: Mean, Median, Mode, Percentiles, Quartiles; Measures of Variability: Range, Inter-quartile Range, Variance, Standard Deviation, Coefficient of Variation;
- Measures of Distribution Shape, Relative Location and Detecting Outliers;
- Exploratory Data Analysis; Weighted Mean & working with Grouped Data
- Measures of Association Between Two Variables; Covariance, Correlation;

Unit-2: Probability & Probability Distribution **(20%)**

- Introduction to Probability; Experiments, Counting, Rules and Assigning Probabilities; Events and their Probabilities;
- Some basic Relationships of Probability
- Conditional Probability
- Baye's Theorem
- Random Variables: Discrete, Continuous;
- Discrete Probability Distributions; Expected Value & Variance;

- Binomial Probability Distribution
- Poisson Probability Distribution
- Normal Probability Distribution, Normal Approximation of Binomial Probabilities
- Exponential Probability Distribution

Unit-3: Sampling, Sampling Distribution & Interval Estimation (15%)

- Simple Random Sampling, Point Estimation
- Introduction to Sampling Distributions
- Sampling Distribution of $\bar{x}$
- Sampling Distribution of $\bar{p}$
- Properties of Point Estimation
- Other Sampling Methods
- Population Mean: σ Known, σ Unknown
- Determining the Sample Size; Population Proportion

Unit-4: Statistical Inference-Testing of Hypothesis & X^2 Test chi-square (20%)

- Introduction
- Test of significance for Large Samples: Difference between Small & Large Samples;
- Two-tailed test for Difference between the Means of Two Samples;
- Standard Error of the Difference between two Standard Deviations.
- Tests of significance for Small Samples: The Assumption of Normality;
- Students' t-Distribution; Properties & Applications of t-Distribution;
- Testing Difference between Means of Two Samples (Independent Samples; Dependent Samples)
- Definition of chi-square; Degrees of freedom; chi-square Distribution; Conditions for Applying Chi-square Test; Uses of chi-square Test; Misuse of chi-square Test

Unit-5: F-Test & Analysis of Variance (15%)

- F-Test or The Variance Ratio Test; Applications of F-Test
- Analysis of Variance: Assumptions; Techniques
- Analysis of Variance in 2-Way Classification Model

Unit-6: Regression, Time Series Analysis & Forecasting (10%)

- Introduction to Regression; Simple linear Regression Model; least Square Method; Coefficient of Determination; Correlation Coefficient;
- Model Assumptions; Residual Analysis: Validating Model Assumptions; Outliers and Influential Observations
- Using the Estimated Regression Equation for Estimation & Prediction
- Introduction to Forecasting & Time Series Analysis; Components of a Time Series
- Smoothing Methods
- Trend Projection
- Trend & Seasonal Components
- Regression Analysis
- Qualitative Approaches to Forecasting

Unit-7: Non-parametric Methods (5%)

- Need for Non-parametric Methods
- Sign Test, Wilcoxon signed-Rank Test, Mann-Whitney-Wilcoxon Test
- Kruskal-Wallis Test
- Rank Correlation

Note: Formulae may be provided for parametric and non-parametric tests.

Main Reference Book:

1. Anderson, Sweeney, Williams, "Statistics for business and economics", 9th edition, Thompson Publication
2. S P Gupta, "Statistical Methods", 30th edition, S Chand

Suggested Additional Reading:

1. J.Susan Milton & Jesse Arnold, "Introduction to Probability & Statistics: Principles & Applications for Engineering & Computing Sciences"
2. Bharat Jhunjhunwala, "Business Statistics", first edition, S Chand, 2008
3. Richard Levin, David Rubin, "Statistics for Management", 7th edition, PHI
4. Nabendu Pal, Sahadeb Sarkar, "Statistics-Concepts and Applications", 2nd edition, PHI

Chapter wise Coverage from the main reference book:

Main Reference Book-1:

Unit 1: Ch-1: 1.1, 1.2; Ch-2: 2.1 to 2.4; Ch-3: 3.1 to 3.6

Unit 2: Ch-4: 4.1 to 4.5; Ch-5: 5.1 to 5.5; Ch-6: 6.2 to 6.4

Unit 3: Ch-7: 7.2 to 7.8; Ch-8: 8.1 to 8.4

Unit 6: Ch-14: 14.1 to 14.4; 14.6, 14.8, 14.9; Ch-18: 18.1 to 18.6

Unit 7: Ch-19: 19.1 to 19.5

Main Reference Book-2:

Unit 4: Ch-3 & Ch-4

Unit 5: Ch-5

Accomplishments of the student after completing the course:

- ✓ **Ability to apply statistical techniques in decision making in solving real-world problems**
- ✓ **Ability to use computers to analyze the data**