STATISTICAL INFERENCE SYLLABUS

Module 1: Introduction to Estimator

- Population, Sample, Parameter, and Statistic
- Estimator and Estimate
- Characteristics of a Good Estimator
    - Unbiasedness
    - Consistency
    - Invariance Property of Consistent Estimators
    - Sufficient Conditions for Consistency
    - Sufficiency
    - Factorization Theorem
    - Minimal Sufficiency
    - Efficiency
- Applications of Lehmann-Scheffe's Theorem
- Rao-Blackwell Theorem and Applications
- Bayesian Estimation

Module 2: Point Estimation

- Methods of Point Estimation
    - Maximum Likelihood Estimation (MLE)
    - Method of Minimum Variance
    - Method of Moments
    - Method of Least Squares
    - Method of Minimum Chi-Square
- Large Sample Properties of MLE (without proof)
- Applications of MLE

Module 3: Interval Estimation

- Confidence Limits and Confidence Coefficient
- Duality between Acceptance Region of a Test and Confidence Interval
- Construction of Confidence Intervals for:
    - Population Proportion (Small and Large Samples)
    - Two Population Proportions (Large Samples)
    - Mean and Variance of a Normal Population
    - Difference Between the Mean and Ratio of Two Normal Populations

Module 4: Testing of Hypotheses

- Types of Errors
- Power of a Test
- Most Powerful Tests
- Neyman-Pearson Fundamental Lemma and Applications
- Uniformly Most Powerful Tests
- Likelihood Ratio Tests
    - Description and Properties
    - Application to Standard Distributions

Module 5: Large Sample Tests

- Large Sample Properties
- Tests of Significance (Under Normality Assumption)
    - Test for a Single Population Mean
    - Test for Proportion
    - Test for Equality of Two Means
    - Test for Equality of Two Proportions
    - Test for Variance
    - Test for Correlation
    - Test for Regression

Module 6: Small Sample Tests

- Student's t-Test
    - Test for Population Mean
    - Equality of Two Population Means
    - Paired t-Test
- F-Test for Equality of Two Population Variances
- Chi-Square Test
    - Goodness of Fit
    - Independence of Attributes

Module 7: Non-Parametric Tests

- Sign Test
- Wilcoxon Signed Rank Test
- Median Test
- Wilcoxon-Mann-Whitney Test
- Run Test
- One Sample Kolmogorov-Smirnov Test
- Kruskal-Wallis H-Test
    - Description
    - Properties
    - Applications