Course Code	Course Title	L	T	P	C
PMDS503L	Statistical Inference	2	0	0	2
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. Understand the types of questions that the statistical method addresses for decision making.
2. Apply statistical methods to hypotheses testing and inference problems.
3. Interpret the results in a way that addresses the question of interest.
4. Communicate the purposes of the analyses, the findings from the analysis, and the implications of those findings.

Course Outcomes

At the end of the course students will be able to:

1. Describe the criteria required of good point estimators, and check whether or not a proposed estimator within a stated statistical model satisfies these criteria.
2. Apply the principle of maximum likelihood, minimum variance and moment estimation methods to obtain point and interval estimates of parameters in one-parameter and multi-parameter statistical models.
3. Construct the hypothesis tests in some common models (including Normal models), correctly using the terms null hypothesis, alternative hypothesis, test statistic, rejection region, significance level, power and p-value.
4. Apply the parametric (Z, t, F, Chi-square) tests and interpret the results.
5. Develop the non-parametric tests, with due regard to the underlying assumptions.

Module:1	Introduction to Estimation	6 hours

Population, sample, parameter and statistic; characteristics of a good estimator; Consistency – Invariance property of Consistent estimator, Sufficient condition for consistency; Unbiasedness; Sufficiency – Factorization Theorem – Minimal sufficiency; Efficiency – Most efficient estimator, likelihood equivalence and uniformly minimum variance unbiased estimator.

Module:2	Methods of Estimation	6 hours

Methods of point estimation – Maximum likelihood estimation, method of minimum variance, method of moment estimator, concept of BLUE.

Module:3	Interval Estimation	2 hours

Methods of Interval estimation - Confidence limits and confidence coefficient, Construction of confidence intervals for population parameters.

Module:4	Testing of hypotheses	2 hours

Null Hypothesis, Alternative Hypothesis, Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Uniformly most powerful tests; Likelihood Ratio tests.

Module:5	Large sample tests	4 hours

Large sample properties; Tests of significance (under normality assumption)- Test for a population mean, proportion; Test for equality of two means and proportions; Test for variance. Sequential Probability Ratio Test.

Module:6	**Small sample tests**	**4 hours**
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 - test for independence of attributes.		
Module:7	**Non-parametric tests**	**4 hours**
Sign test, Signed rank test, Median test, Mann-Whitney -test, Run test, Kolmogorov –Smirnov test and Kruskal – Wallis-H-test**.**		
Module:8	**Contemporary Issues**	**2 hours**
	Total Lecture hours	**30 hours**

Text Book(s)	
1	Robert V Hogg, Elliot A Tannis and Dale L. Zimmerman, Probability and Statistical Inference, 2020, 10th Edition, Pearson.
2	Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference- Testing of Hypotheses, 2014, Prentice Hall of India.
Reference Book(s)	
1	Rajagopalan M and Dhanavanthan P, Statistical Inference, 2012, PHI Learning.
2	B. K. Kale and K. Muralidharan, Parametric Inference, 2016, Narosa Publishing House
3	Marc S. Paolella, Fundamental statistical inference: A computational approach, 2018, Wiley.

Mode of evaluation: CAT, Assignment , Quiz and FAT			
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