Course code	Course Title	L	T	P	C
BCSE333L	Statistical Inference	2	0	0	2
Pre-requisite	NIL	Syllabus version			
		1.0			

Course Objectives

1. To study statistical methods for hypotheses testing and solving inference problems.
2. To interpret the results in a way that draws evidence-based and well-informed decisions from data.
3. To derive conclusions from data and analyze its implications.

Course Outcomes

At the end of the course, the student will be able to

1. Understand the notion of a parametric model, point estimation of the parameters and properties of a good estimator.
2. Learn the concept of interval estimation and confidence intervals.
3. Understand and perform large-sample tests of hypotheses.
4. Discuss nonparametric tests of hypotheses.
5. Translate and correlate the statistical analysis into Statistical inference

Module:1	Introduction to Estimator	4 hours

Population, sample, parameter and statistic- Estimator, Estimate-characteristics of a good estimator – Unbiasedness- Consistency-Invariance property of Consistent estimator- Sufficient condition 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	5 hours

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 of MLE, Method of Minimum variance, method of moments, method of least squares, method of minimum chi-square.

Module:3	Interval Estimation	3 hours

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.

Module:4	Testing of hypotheses	4 hours

Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemmaand its applications; Notion of Uniformly most powerful tests; Likelihood Ratio tests: Description and property of LR tests - Application to standard distributions.

Module:5	Large sample tests	4 hours

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

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, independence of attributes.

Module:7	Non-parametric tests	4 hours

Sign test, Wilcoxon Signed rank test, Median test, Wilcoxon-Mann-Whitney test, Run test and One sample Kolmogorov Smirnov test, Kruskal Wallis-H-test: Description, properties and applications.

Module:8	**Contemporary Issues**	**2 hours**
	Total hours	**30 hours**

Text Book(s)	
1.	Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference, 9th Edition, Pearson publishers, 2015.
2.	Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference Testing of Hypotheses, Prentice Hall of India, Kindle Edition, 2014.
Reference Books	
1.	Marc S. Paolella, Fundamental statistical inference: A computational approach, Wiley, 2018.
2.	B. K. Kale and K. Muralidharan, Parametric Inference, Narosa Publishing House, 2016.
3.	Miller, I and Miller, M, John E. Freund's Mathematical statistics with Applications, Pearson Education, 2002.
4.	George Casella and Roger L.Berger, Statistical Inference, 2nd edition, Casebound Engelska, 2002.

Mode of Evaluation: CAT / written assignment / Quiz / FAT / Project / Seminar			
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Approved by Academic Council	No. 66	Date	16-06-2022