

Course Code: 0542-221(Stat-221) Course Title: Statistical Inference-I
Marks:100 Credits: 03 Number of Class: 39-42

Rationale:

This course is designed to introduce the students with fundamental concepts and techniques of statistical inference including estimation and test of hypotheses to be used in courses at advanced level.

Objectives:

The aim of this course is to:

- Initiate students with the basic theory behind the development and assessment of statistical analysis techniques in the areas of point and interval estimation as well as hypothesis testing.
- Help the students to develop a deeper understanding of the basis underlying modern statistical inference.
- Able students to draw statistical inference from point estimates of estimated parameters and interpret these estimates.
- Acquaint/Equip students with a statistical tool kit which will enable them to apply their knowledge and skills to real world tasks.

Course Learning Outcomes:

At the end of this course students will be able to

CLO1	Estimate unknown parameters of a given probability distribution using different methods of estimation.
CLO2	Explain in detail and demonstrate approaches to include a measure of accuracy for estimation procedures and our confidence in them by examining the area of interval estimation.
CLO3	Organize the theoretical underpinnings of tests for both simple and composite hypotheses conceptually.
CLO4	Recognize the general trends in statistical inference and apply this knowledge to make well-informed decisions when performing data analysis.

Mapping between PLOs and CLOs of Statistics program

CLOs	Course Content	Teaching Strategy	Assessment Strategy	No. of Lec.
CLO1	Point Estimation: Principle of Point Estimation, Methods of Finding	Interactive Class	Assignments, Class	15

	Estimators: Maximum Likelihood Estimation, Method of Moments, Method of Minimum χ^2, Method of Least Squares, Method of Minimum Distance. Properties of Estimators: Closeness, Unbiasedness, Consistency, Fisher's Consistency, Sufficiency, Efficiency, minimal sufficient statistics, complete statistics. Pitman Closer and Closest Estimator, Mean Squared Error, Loss Function, Risk Function. Minimax Estimator, Admissible Estimator, Correction for Bias, Consistent Asymptotically Normal (CAN) Estimators, Best Asymptotically Normal (BAN) Estimators, MVUE, Cramer-Rao Lower Bound, Completeness, Rao-Blackwell Theorem, Lehman-Scheffe Theorem.			
CLO2	Interval Estimation: Concept of Confidence Interval, Method of Finding Confidence Intervals: Pivotal Quantity Method and Statistical Method, Confidence Interval for Mean, Variance. Simultaneous confidence region for the mean and variance, confidence interval for difference in means.			5
CLO3	Test of Hypothesis: Simple hypothesis, Composite Hypothesis, Critical region, Best Critical Region, Two-sided BCR, Steps of Hypothesis Testing, p-value, Test of Mean, Variance, Proportion, Correlation, Regression Coefficients, Test of Homogeneity in Parallel Samples. Power of test.			10

Course Content, Teaching and Assessment Strategy

CLOs	Course Content	Teaching Strategy	Assessment Strategy	No. of Lec.
CLO1	Point Estimation: Principle of Point Estimation, Methods of Finding Estimators: Maximum Likelihood Estimation, Method of Moments, Method of Minimum χ^2 , Method of Least Squares, Method of Minimum Distance. Properties of Estimators: Closeness, Unbiasedness, Consistency, Fisher's Consistency, Sufficiency, Efficiency, Pitman Closer and Closest Estimator, Mean Squared Error, Loss Function, Risk Function. Minimax Estimator, Admissible Estimator, Correction for Bias, Consistent Asymptotically Normal (CAN) Estimators, Best Asymptotically Normal (BAN) Estimators, MVUE, Cramer-Rao Lower Bound, Completeness, Rao-Blackwell Theorem, Lehman-Scheffe Theorem.	Interactive Class, Open Discussion, Participatory Q/A Session, Online resources and Practical	Assignments, Class Tests, Presentation, Attendance and Final Examination.	15
CLO2	Interval Estimation: Concept of Confidence Interval, Method of Finding Confidence Intervals: Pivotal Quantity Method and Statistical Method, Confidence Interval for Mean, Variance.			5
CLO3	Test of Hypothesis: Simple hypothesis, Composite Hypothesis, Critical region, Best Critical Region, Two-sided BCR, Steps of Hypothesis Testing, p -value, Test of Mean, Variance, Proportion, Correlation, Regression Coefficients, Test of Homogeneity in Parallel Samples.			10
CLO4	Pitman Closer and Closest Estimator, Mean Squared Error, Loss Function,			12

	Risk Function. Minimax Estimator, Admissible Estimator, Correction for Bias, Consistent Asymptotically Normal (CAN) Estimators, Best Asymptotically Normal (BAN) Estimators, MVUE, Cramer-Rao Lower Bound, Completeness, Rao-Blackwell Theorem, Lehman-Scheffe Theorem.			
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Mapping of Course Learning Outcomes (CLOs) with the Teaching – Learning & Assessment Strategy

CLOs	Teaching-Learning Strategy	Assessment Strategy
CLO1	Classroom Discussion and interactive learning	Quiz, Mid Term, and Summative assessment
CLO2	Problem-solving activities and Collaborative learning spaces	Mid Term, Assignment, Presentation and Summative assessment
CLO3	Lecture, Current events quizzes, and Reflective Discussion	Summative assessment
CLO4	Lecture, Group discussion and Slide Show	Summative assessment

Text Book

1. Mood, A. M. and Graybill, F. A. and Boes, D.C. (1974): *Introduction to the Theory of Statistics*, 3rd edition, McGraw-Hill, New York.

Reference Books

1. Hogg, R.V. and Craig, A. T (2009): *Introduction to Mathematical Statistics*, 6th edition, Pearson Education, Singapore.
2. Kendall, M.G. and Stuart, A. (2004): *Advanced Theory of Statistics*, 14th edition, Edward Arnold, New York.
3. Cassela, G. and Berger, R. L. (2001): *Statistical Inference*, Wadsworth Publishing Company, California.