LNMIIT, Jaipur

Department of Mathematics

Programme: M.Sc./B.Tech.	Course Title: Mathematical Statistics		Course Code: MTH
Type of Course: Open Elective	Prerequisites: Probability Theory		Total Contact Hours: 40
Year/Semester: M.Sc. 2nd year/ 7th Semester	Lecture Hrs/Week: 3	Tutorial Hrs/Week: 0	Practical Hrs/Week: 0	Credits: 3

Learning objective: This course introduces techniques of statistical Inference. The main aim of the course is to study random sampling, likelihood principle, point estimation, hypothesis testing, Interval estimation. These methods are heavily used in Machine learning, Data Mining etc.

Course outcomes (COs):

On completion of this course, the students will have the ability to:		Bloom's Level
CO-1	**Discuss** random sampling, order statistics, various mode of convergence, consistency of estimators	2
CO-2	**compute** the point estimators and evaluate the estimators	3
CO-3	**Illustrate** hypothesis testing.	3
CO-4	**Evaluate** interval estimators and analyze them.	5

Course Design Template version 1.0

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Course Topics:

Course Topics	Lecture Hours	
UNIT – I (Properties of Random Sample)	12	
Basic Concepts of Random Samples, Sampling distributions, Sampling from the Normal Distribution: chi squared distribution, Beta & Gamma Distribution, t-distribution, F-distribution, Order Statistics: Joint and marginal distributions, Distributions of range, midrange of order statics, Almost sure convergence, Convergence in Probability, Weak law of large numbers, Consistency of sample mean, sample variance and sample standard deviation, Convergence in distribution, Central Limit Theorem with continuity correction, Slutsky's Theorem, Sufficient Statistics.		CO1
UNIT – II (Point Estimation)	08	CO2
Methods of Finding Point Estimators: Method of Moments, Maximum Likelihood Estimators, Baeyes Estimators, The EM Algorithm, Methods of Evaluating Estimators: Mean Squared Error, Best Unbiased Estimators, Cramer-Rao inequality, Sufficiency and Unbiasedness		
UNIT – III (Hypothesis Testing)	10	CO3
Methods of Finding Tests: Likelihood Ratio Tests, Bayesian Tests, Union-Intersection and Intersection-Union Tests, Methods of Evaluating Tests: Error Probabilities and the Power Function, Most Powerful Tests, Neyman-Pearson Lemma, p- Values		
UNIT-IV (Interval Estimation)	10	
Methods of Finding Interval Estimators: Inverting a Test Statistic, Pivotal Quantities, Pivoting the CDF, Bayesian Intervals, Methods of Evaluating Interval Estimators: Size and Coverage Probability, Test-Related Optimality		CO4

Textbooks (IEEE format):

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[1] George Casella & Roger L. Berger, Statistical Inference, Second Edition, Wadsworth, a part of Cengage Learning (2002).

References Books

[1] Vijay K. Rohatgi & A.K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, Third Edition, John Wiley & Sons (2015).

[2] Hogg, R., McKean. J. and Craig, A., Introduction to Mathematical Statistics, 8th Edition,

Pearson, Boston, 2019.

[3] DeGroot, M. and Schervish, M., Probability and Statistics, 4th Edition, Addison Wesley, Boston, 2002.

Evaluation Methods:

Item	Weightage
Quizzes(2)	25%
Mid-Term	25%
End-Term	50%

CO and PO Correlation Matrix
CO and PO Correlation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3		1								
CO3	3	3		1								
CO4	3	3										

1 – Low; 2- Medium; 3 - High

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Last Update: August 06, 2023