Indraprastha College for Women
University of Delhi

Course Name:	B.Sc (H) Mathematics
Paper Title:	Mathematical Statistics
Unique Paper Code:	
Semester:	5
Faculty(s):	Dr. Suman
Year:	2024

Work Plan

Period	Unit No.	Learning Objective	Topics to be Covered
1st Aug -3rd Aug	1	The joint behavior of several random variables theoretically and through illustrative practical examples	Joint Distributed Random Variables: Joint probability mass function for two discrete random variables, Marginal probability mass function, Joint probability density function for two continuous random variables, Marginal probability density function, Independent random variables.
5th Aug-10th Aug	1	The joint behavior of several random variables theoretically and through illustrative practical examples	Expected values, covariance, and correlation
12th Aug-17th Aug	1	The joint behavior of several random variables theoretically and through illustrative practical examples	Linear combination of random variables and their moment generating functions
19th Aug-24th Aug	1	The joint behavior of several random variables theoretically and through illustrative practical examples	Conditional distributions and conditional expectation, Laws of total expectation and variance.
26th Aug-31st Aug	1	Understand joint distributions of random variables including the bivariate normal distribution	Bivariate Normal Distribution.
2nd Sep-7th Sep	2	Estimate model parameters from the statistical inference based on point estimation and hypothesis testing	Distribution of important statistics such as the sample totals, sample means, and sample proportions, Central limit theorem (statement with examples and applications), Law of large numbers.

9th Sep-14th Sep	2	Estimate model parameters from the statistical inference based on point estimation and hypothesis testing	Chi-squared, t, and F distributions; Distributions based on normal random samples.
16th Sep-21st Sep	2	Estimate model parameters from the statistical inference based on point estimation and hypothesis testing	Concepts and criteria for point estimation, The methods of moments and MLE.
23rd Sep-28th Sep	2	Apply Rao-Blackwell theorem for improving an estimator, and Cramér-Rao inequality to find lower bound on the variance of unbiased estimators of a parameter	Assessing estimators: Accuracy and precision, Unbiased estimation, Consistency and sufficiency,
30th Sep-5th Oct	2	Apply Rao-Blackwell theorem for improving an estimator, and Cramér-Rao inequality to find lower bound on the variance of unbiased estimators of a parameter	The Neyman factorization theorem, Rao-Blackwell theorem, Fisher Information, Rao inequality (statement only), Efficiency
7th Oct-12th Oct	3	Apply Rao-Blackwell theorem for improving an estimator, and Cramér-Rao inequality to find lower bound on the variance of unbiased estimators of a parameter	Interval estimation and basic properties of confidence intervals, One-sample t confidence interval
14th Oct-19th Oct	3		Confidence intervals for a population proportion and population variance.
21st Oct-26th Oct	3	Apply Rao-Blackwell theorem for improving an estimator, and Cramér-Rao inequality to find lower bound on the variance of unbiased estimators of a parameter	Statistical hypotheses and test procedures, One-sample tests about a population mean and a population proportion
28th Oct-2nd Nov			MID SEMESTER BREAK
4th Nov-9th Nov	3	Understand the theory of linear regression models and contingency tables	P-values for tests; The simple linear regression model and its estimating parameters.
11th Nov-16th Nov	3	Understand the theory of linear regression models and contingency tables	Chi-squared goodness-of-fit tests
18th Nov-23rd Nov	3	Understand the theory of linear regression models and contingency tables	Two-way contingency tables
25th Nov-27th Nov			Revision
28th Nov			DISBERSAL OF CLASSES

Unit	TOPICS
I	Joint probability mass function for two discrete random variables, Marginal probability mass function, Joint probability density function for two continuous random variables, Marginal probability density function, Independent random variables; Expected values, covariance, and correlation; Linear combination of random variables and their moment generating functions; Conditional distributions and conditional expectation, Laws of total expectation and variance; Bivariate normal distribution.
II	Distribution of important statistics such as the sample totals, sample means, and sample proportions, Central limit theorem, Law of large numbers; Chi-squared, t, and F distributions; Distributions based on normal random samples; Concepts and criteria for point estimation, The methods of moments and maximum likelihood estimation (MLE); Assessing estimators: Accuracy and precision, Unbiased estimation, Consistency and sufficiency, The Neyman factorization theorem, Rao-Blackwell theorem, Fisher Information, The Cramér-Rao inequality, Efficiency
III	Interval estimation and basic properties of confidence intervals, One-sample t confidence interval, Confidence intervals for a population proportion and population variance. Statistical hypotheses and test procedures, One-sample tests about a population mean and a population proportion, P-values for tests; The simple linear regression model and its estimating parameters; Chi-squared goodness-of-fit tests, Two-way contingency tables.

S. No.	Name of Authors/Books/Publishers
1.	Devore, Jay L., Berk, Kenneth N. & Carlton Matthew A. (2021). Modern Mathematical Statistics with Applications. (3rd ed.). Springer
2.	Hogg, Robert V., McKean, Joseph W., & Craig, Allen T. (2019). Introduction to Mathematical Statistics. Eighth edition, Pearson. Indian Reprint 2020.
3.	Mood, A.M., Graybill, F.A., & Boes, D.C. (1974). Introduction the Theory of Statistics (3rd ed.). Tata McGraw Hill Pub. Co. Ltd. Reprinted 2017
4.	Wackerly, Dennis D., Mendenhall III, William & Scheaffer, Richard L. (2008). Mathematical Statistics with Applications. 7th edition, Cengage Learning.