ARSD College, University of Delhi

Model Course Handout/Lesson Plan

Course Name : B.Sc. (Mathematics (Honours))						
Semester	**Course Code**	**Course Title**	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Credit (C)**
1	DSC-3	Probability and Statistics	3	0	1	4
Teacher/Instructor(s)		Prashant Kumar				
Session		2022-23				

Course Objective:

To make the students familiar with the basic statistical concepts and tools which are needed to study situations involving uncertainty or randomness. The course intends to render the students to several examples and exercises that blend their everyday experiences with their scientific interests to form the basis of data science.

Course Learning Outcomes:

This course will enable the students to:

i) Understand some basic concepts and terminology—population, sample, descriptive andinferential statistics including stem-and-leaf plots, dotplots, histograms and boxplots.
ii) Learn about probability density functions and various univariate distributions such asbinomial, hypergeometric, negative binomial, Poisson, normal, exponential and lognormal.
iii) Understand the remarkable fact that the empirical frequencies of so many natural populations,exhibit bell-shaped (i.e., normal) curves, using the Central Limit Theorem.
iv) Measure the scale of association between two variables, and to establish a formulation helpingto predict one variable in terms of the other, i.e., correlation and linear regression.

Lesson Plan:

Unit No.	Learning Objective	Lecture No.	Topics to be covered
1.	Descriptive Statistics, Probability, and Discrete Probability Distributions	1 & 2	Populations, Samples, Stem-and-leaf displays
		3 & 4	Dotplots, Histograms, Qualitative data
		5 & 6	Measures of location, Measures of variability, Boxplots
		7 & 8	Sample spaces and events, Probability axioms and properties.
		9 & 10	Conditional probability, Bayes' theorem
		11 & 12	Bayes' theorem and independent events.
		13 & 14	Discrete random variables and probability distributions, Expected values
		15 & 16	Probability distributions with their mean and variance: Binomial, geometric distribution
		17 & 18	Hypergeometric, negative binomial, Poisson, and Poisson distribution as a limit.
2.	Continuous Probability Distributions	19 & 20	Continuous random variables, Probability density functions
		21 & 22	Probability density functions, Uniform distribution
		23 & 24	Cumulative distribution functions and expected values.
		25 & 26	Normal and standard normal distributions with their percentiles
		27 & 28	Approximating the binomial distribution; Exponential distribution
		29 & 30	Exponential distribution, Lognormal distribution.
3.	Central Limit Theorem and Regression Analysis	31 & 32	Sampling distribution and standard error of the sample mean.
		33 & 34	Sampling distribution and standard error of the sample mean
		35 & 36	Central Limit Theorem and applications.
		37 & 38	Scatterplot of bivariate data, Regression line using principle of least squares (statement with normal equations)
		39 & 40	Predicted values and the residuals, Error sum of squares,
		41 & 42	Coefficient of determination, The sample correlation coefficient and properties.

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment		25
	• Quiz		
	• Class Test		
	• Attendance		
	• Assignment		
2.	End Semester Examination	3 hr	Theory:75 Practical:25

Details of the Course		
Unit	**Contents**	**Contact Hours**
1	**Descriptive Statistics, Probability, and Discrete Probability Distributions** Descriptive statistics: Populations, Samples, Stem-and-leaf displays, Dotplots, Histograms, Qualitativedata, Measures of location, Measures of variability, Boxplots; Sample spaces and events, Probability axioms and properties, Conditional probability, Bayes' theorem and independent events; Discrete random variables and probability distributions, Expected values; Probability distributions: Binomial, geometric, hypergeometric, negative binomial, Poisson, and Poisson distribution as a limit.	18
2	**Continuous Probability Distributions** Continuous random variables, Probability density functions, Uniform distribution, Cumulativedistribution functions and expected values, The normal, exponential and lognormal distributions.	12
3	**Central Limit Theorem and Regression Analysis** Sampling distribution and standard error of the sample mean, Central Limit Theorem and applications; Scatterplot of bivariate data, Regression line using principle of least squares, Estimation using the regression lines; Sample correlation coefficient and properties.	12
	Total	**42**
Suggested Books:		

Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1	Devore, Jay L. (2016). *Probability and Statistics for Engineering and the Sciences* (9th ed.).Cengage Learning India Private Limited. Delhi. Indian Reprint 2020.	2020
2	Mood, A. M., Graybill, F. A., & Boes, D. C. (1974). *Introduction to the Theory of Statistics* (3rd ed.). Tata McGraw-Hill Pub. Co. Ltd. Reprinted 2017.	2017
Mode of Evaluation:	Internal Assessment / End Semester Exam	

Progress Report:

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		5 & 6	Measures of location, Measures of variability, Boxplots
		7 & 8	Sample spaces and events, Probability axioms and properties.
		9 & 10	Conditional probability, Bayes' theorem
		11 & 12	Bayes' theorem and independent events.
		13 & 14	Discrete random variables and probability distributions, Expected values
		15 & 16	Probability distributions with their mean and variance: Binomial, geometric distribution
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3.	Central Limit Theorem and Regression Analysis	31 & 32	Sampling distribution and standard error of the sample mean.
		33 & 34	Sampling distribution and standard error of the sample mean
		35 & 36	Central Limit Theorem and applications.
			Scatterplot of bivariate data, Regression line using principle of least squares (statement with normal equations)
			Predicted values and the residuals, Error sum of squares,
			Coefficient of determination, The sample correlation coefficient and properties.