M. G. Science Institute, Ahmedabad

Autonomous | Affiliated to Gujarat University, Ahmedabad

(Managed by The Ahmedabad Education Society)

Department of Statistics

Bachelor of Science (Hons.) in Statistics

B.Sc. (Hons.) Statistics

4 Year, 8 Semester Full-Time Programme

Choice Based Credit System (CBCS) & Grading System

Outcome-Based Education Pattern

(Effective from Academic Year 2024-25)

Semester: IV	Course Title: Probability Distributions-II	Credit: 4
Course No.: STM241		Hours: 4/week

Course Outcomes: On successful completion of the course the learner will be able to

CO	COGNITIVE ABILITIES	COURSE OUTCOMES
CO 1	REMEMBERING	Remember the basic concepts of discrete and continuous probability distributions, univariate distributions, and bivariate distributions.
CO 2	UNDERSTANDING	Understand the concept of univariate and bivariate probability distributions. Understand the concept of transformation of random variables.
CO 3	APPLYING	Apply univariate and bivariate probability distributions to solve real-life problems including calculating probabilities and expected values.
CO 4	ANALYSING	Analyse and compare different probability distributions to select the appropriate model for specific real-life applications.
CO 5	EVALUATING	Evaluate the suitability and performance of probability distribution models in representing data.
CO 6	CREATING	Develop probabilistic models using appropriate probability distributions to address complex problems in a practical context.

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	3				2
CO 2	2			2	2
CO 3	3	2		2	
CO 4	3	3	2	3	
CO 5	2		3	2	
CO 6	3	2	2		2

Unit	Detailed Syllabus	No. of Hours of Teaching
I	**Discrete Probability Distributions-II** **Geometric Distribution:** Definition, First Four Moments, Generating Functions, Memoryless Property **Negative Binomial Distribution:** Definition, First Four moments, Generating Functions, Negative Binomial as an approximation to Poisson Distribution, Applications of negative Binomial Distributions.	15
II	**Continuous Probability Distributions-II** **Gamma Distribution:** Definition, First Four Moments, Generating Functions, Additive Property. **Weibull Distribution:** Definition, Mean and Variance, Distribution Function, Special Cases. **Log-normal Distribution:** Derivation and Definition, First Four moments, Mean, Mode, Variance, Generating Functions	15
III	**Bivariate Normal Distribution:** Definition, Derivation of Marginal Distribution of X, Marginal distribution of Y, Conditional distribution of X given Y, Conditional distribution of Y given X. Examples on Bivariate Normal Distributions. Condition for Independence.	15

IV	**Functions of Random Variables** Distributions of functions of one- and two-dimensional random variables. Basic idea and concept of Jacobian of transformation in the derivation of distribution of function of random variables. Use of Jacobian of the transformation in distribution deriving distribution of a function of two random variables. The general form of distribution of the sum of two independent random variables, the difference between two independent random variables, the product of two independent random variables, quotient (ratio) of two independent random variables.	15

Suggested Reference Books:

1. Mood, A.M., Greybill, F.A. and Bose, D.C. (1974): Introduction to the Theory of
2. Statistics, McGraw Hill.
3. Mukhopadhyay, P. (1996): Mathematical Statistics, New Central Book Agency.
4. Rohtagi, V.K. (1967): An Introduction to Probability Theory and Mathematical Statistics, John Wiley and Sons.
5. Hoel, P.G. (1971): Introduction to Mathematical Statistics, Asia Publishing House.
6. Meyer, P.L. (1970): Introductory Probability and Statistical Applications, Addison Wesley.
7. Gupta, S.C., and Kapoor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand Publications.
8. Goon, A.M., Gupta, M.K. and Das Gupta, B. (1991): Fundamentals of Statistics, Vol. I, WorldPress, Calcutta.
9. A First Course in Probability - Sheldon. M. Ross, (Mc Millian Publishing Co.)
10. Introduction to Probability and Statistics for Engineers and Scientists-S.M. Ross (Elsevier)