

Course Code	Course Title	L	T	P	C
PMDS502L	PROBABILITY AND DISTRIBUTION MODELS	3	0	0	3
Pre-requisite	NIL	Syllabus version			
		1.0			
Course Objectives					
1. To incorporate the concepts of probability theory and its applications as the core material in building theoretical ideas along with the practical notion.					
2. To integrate the intrinsic ideas of preliminary and advanced distributions to correlate with the real-world scenarios.					
Course Outcomes					
At the end of the course, students will be able to:					
1. Develop the problem-solving techniques needed to calculate probability and conditional probability.					
2. Describe and construct the probability distribution functions and illustrate the mathematical expectation.					
3. Demonstrate the various types of generating functions used in statistics.					
4. Apply the commonly used univariate discrete and continuous probability distributions.					
5. Illustrate the sampling distributions and its importance in Inferential statistics.					
Module: 1	Probability	4 hours			
Introduction – Random Experiments, Empirical basis of probability, Algebra of events, laws of probability; Conditional Probability, Independence, Bayes' law; Application of probability to business and economics.					
Module: 2	Random Variables	7 hours			
One-dimensional Random variable- Discrete and Continuous; Distribution functions and its properties; Bivariate Random Variables- Joint Probability functions, marginal distributions, conditional distribution functions; Notion of Independence of Random variables. Functions of random variables: introduction, distribution function technique, transformation technique: one variable, transformation technique: several variables, theory and applications.					
Module: 3	Mathematical Expectation	9 hours			
Expectation, Variance, and Co-variance of random variables; Conditional expectation and conditional variance; Markov, Holder, Jensen and Chebyshev's Inequality; Weak Law of Large numbers, Strong law of large numbers and Kolmogorov theorem; Central Limit Theorem.					
Module: 4	Generating Functions	4 hours			
Moment Generating Function, Characteristic Function and Probability Generating Function - Properties and Applications.					

Module: 5	Discrete Distributions	8 hours
Bernoulli, Binomial, Poisson, Geometric, Hyper-geometric, Negative Binomial, Multinomial, distributions and Discrete Uniform distribution - definition, properties and applications with numerical problems.		
Module: 6	Continuous Distributions	8 hours
Uniform, Normal distribution function, Exponential, Gamma, Beta distributions (First and Second kind), Weibull, Cauchy and Laplace distribution functions - definition, properties and applications, concept of truncated distributions.		
Module: 7	Sampling Distributions	3 hours
Introduction, The sampling distribution of the Mean: Finite Populations, Sampling distribution of the proportion: Finite Populations, distribution of sample variance, Chi-square distribution, t- distribution, F distribution, order statistics: properties and its applications.		
Module: 8	Contemporary Issues	2 hours
	Total Lecture hours	45 hours
Text Book(s)		
1	Sheldon M. Ross, A First course in Probability, 2020, 10 th Edition, Pearson.	
2	R.V. Hogg, J. W. McKean, and Allen T. Craig, An Introduction to Mathematical Statistics, 2019, 8 th Edition, Pearson Education.	
Reference Book(s)		
1	Rohatgi, V.K. and Ebsanes Saleh, A.K. Md., An Introduction to Probability and Statistics, 2002, 2nd Edition, John Wiley & Sons.	
2	Krishnamoorthy, K., Handbook of Statistical Distributions with Applications, 2006, Chapman & Hall/CRC.	
3	Gupta, S.C. and Kapoor V.K., Fundamentals of Mathematical Statistics, 2020, Sultan Chand & sons.	
4	Maurits Kaptein, Edwin van den Heuvel, Statistics for Data Scientists: An Introduction to Probability and Statistics and Data Analysis, 2022, Springer.	
Mode of Evaluation: CAT, Quiz, Assignment and FAT		
Recommended by Board of Studies		15.02.2024
Approved by Academic Council		No. XX Date DD-MM-YYYY