(Mater of Science in Statistics) (Master of Science) (M. Sc.) (Statistics) Semester (II)

Course Code	PS02CSTA51	Title of the Course	STOCHASTIC PROCESSES
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	1. To learn analysis and modeling of jointly distributed random variables using Markov approach 2. To understand fundamentals of popularly useful Markov Chains, Counting processes and Diffusion processes 3. To gain knowledge of application areas of some classical stochastic processes

Course Content		
Unit	Description	Weightage* (%)
1.	Introduction to Stochastic Processes: Classification of stochastic processes. Chapman-Kolmogorov equations, calculation of n-step transition probability, classification of states. Absorbing Markov chain, Ergodic Markov chain, Stationary distribution, various random walk models, Time reversible Markov chain, Applications in various domains.	25
2.	Discrete Branching process: Galton-Watson branching process, probability of ultimate extinction, distribution of population size. Discrete state space continuous time stochastic processes: Counting process, Poisson process, Generalization of Poisson process. Introduction to Renewal process	25
3.	Birth and death process: Special cases of birth and death process such as queues, simple trunk line process. Stationary processes: weakly and strongly stationary processes. Moving average and auto regressive processes.	25
4.	Continuous time and continuous state space Markov process: Kolmogorov-Feller differential equations, Diffusion processes with Wiener process and Ornstein-Uhlenbeck process as particular cases. First passage time and other problems	25

Teaching-Learning Methodology	Interactive Class Lectures, ICT Tools, Problem solving and Group Seminar.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learnerwill be able to	
1.	Associate problem descriptions with types of Markov chain and solve them by applying the Markov chain results to answer the questions in a given problems
2.	Identify major application areas of Poisson processes and of birth and death process theory and solve them.
3.	Understand types of renewal processes and solve real life problems using them.
4.	Differentiate among types of Markov processes.
5.	Understand nuances of diffusion process and able to derive transition probability density of normal stochastic process according to two Brownian Motion models.

Suggested References:	
Sr. No.	References
1.	Medhi, J. (1981, 2009). Stochastic Processes, 1st, 2nd, 3rd ed., Wliey Eastern
2.	Kulkarni, V.G. (2015, 2017). Modeling and Analysis of Stochastic Systems, 2nd , 3rd ed., Special Indian Edition, International ed.,CRC Press, T&F G
3.	Ross, S. M. (2010), Introduction to Probability Models, 10th ed., Academic Press, Elsevier

4.	Bhat, B. R. (2004). Stochastic Models, Analysis and Applications, New Age International P Ltd
5.	Basu, A. K. (2003). Introduction to Stochastic Processes, Narosa Publishing House
6.	Valdimir I. R. (2013). Probability and Stochastic Modeling, CRC Press, T & F G
7.	Sundarapandian, V. (2009). Probability, Statistics and Queueing Theory, Prentice Hall of India
8.	Yates, R. D. and Goodman, D. J. (2005). Probability and Stochastic Processes, A friendly Introduction for Electrical and Computer Engineers, 2nd ed., John Wiley
9.	Arnold O. Allen (2005), Probability, Statistics and Queueing Theory with Computer Science Applications, 2nd ed., Academic Press Elsevier
10.	Linda, J. S. Allen (2011). An Introduction to Stochastic Processes with Applications to Biology, 2nd ed., CRC Press, T&F G
11.	Zdzislaw, B. and Tomasz, Z. (1999). Basic Stochastic Processes, Springer –Verlag, London

*****