

**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI**

**COURSE PLAN (November 2024 – April 2025)**

**Department** : Mathematics  
**Name/s of the Faculty** : Dr. A. S. Shanthi  
**Course Title** : STOCHASTIC PROCESSES  
**Course Code** : 23MT/PC/SP44  
**Shift** : I

**COURSE OUTCOMES (COs)**

COs	Description	CL
CO1	define the basic concepts in stochastic process	K1
CO2	demonstrate the ability to use the appropriate statistical tools to solve problems of random process	K2
CO3	apply the mathematical models under stochastic process	K3
CO4	analyse the use of concepts in various stochastic models, Markov chains and Martingales	K4
CO5	evaluate the processes from the point of view of probabilistic theory	K5

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Nov 18 – 25, 2024 (Day Order 1-6)	1	1.1 Examples of Stochastic Processes 1.2 The Poisson Process	K1-K5	5	CO1-CO5	Lecture & Problem Solving	Questioning

Nov 26- Dec 3, 2024 (Day Order 1 to 6)	1	1.3 Inter arrival and Waiting Time Distributions 1.4 Conditional Distribution of the Arrival Times	K1-K5	5	CO1-CO5	Presentation	Quiz
Dec 4-11, 2024 (Day Order 1 to 6)	1&2	1.5 The M/G/1 Busy Period 2.1 Chapman – Kolmogorov Equations and Classification of States	K1-K5	5	CO1-CO5	Project assignment	Questioning
Dec 12-19, 2024 (Day Order 1 to 6)	2	2.2 Limit Theorems 2.3 Transitions Among Classes, the Gambler’s Ruin Problem and Mean Times in Transient Status	K1-K5	5	CO1-CO5	Lecture & Problem Solving	<b>III Component 1 – Seminar (15 marks) Portion: Selected portions from Unit 3-5</b>
Dec 20, 2024 (Day Order 1)	2	2.4 Branching Process	K1-K5	1	CO1-CO5	Presentation	Questioning
Jan 3 – 7, 2025 (Day Order 3 to 6)	2	2.5.1 A Markov Chain Model of Algorithmic Efficiency 2.5.2 An Application to Runs – A Markov Chain	K1-K5	3	CO1-CO5	Lecture & Problem Solving	Slip test

		with a Continuous State Space					
Jan 8 – 17, 2024 (Day Order 1 to 6)	2 & 3	2.5.3 List Ordering Rules – Optimality of the Transposition Rule 3.1 Continuous – Time Markov Chain	K1-K5	5	CO1-CO5	Presentation	Questioning
Jan 18 - 23, 2025	<b>C.A. Test – I(Unit 1 &amp; 2.1-2.4)</b>						
Jan 24 -31, 2025 (Day Order 1 to 6)	3	3.2 Birth and Death Processes 3.3 The Kolmogorov Differential Equations	K1-K5	5	CO1-CO5	Project assignment	Quiz
Feb 3-8, 2025 (Day Order 1 to 6)	3	3.4 Limiting Probabilities	K1-K5	5	CO1-CO5	Project assignment	Assignment
Feb 10– 18, 2025 (Day Order 1 to 4)	4	4.1 Stopping Times	K1-K5	3	CO1-CO5	Lecture & Problem Solving	<b>III Component – II (slip test – 20 marks) Portion: 2.5.1-2.5.3</b>
Feb 19- 26, 2025 (Day Order 1-6)	4	4.2 Azuma’s Inequality for Martingales	K1-K5	5	CO1-CO5	Presentation	Questioning
Feb 27- Mar 6, 2025 (Day Order 1 to 6)	4	4.3 Submartingales, Supermartingales and the Martingale Convergence Theorem	K1-K5	5	CO1-CO5	Project assignment	Slip test

Mar 7 – 11, 2025 (Day Order 1 to 3)	5	5.1 Hitting Times, Maximum Variable and Arc Sine Laws 5.2.1 Brownian motion Absorbed at a Value 5.2.2 Brownian Motion Reflected at the Origin	K1-K5	3	CO1-CO5	Lecture & Problem Solving	Questioning
Mar 12 –17, 2025	<b>C.A. Test – II (Unit 3 &amp; 4.1, 4.2)</b>						
Mar 18 – 20, 2025 (Day 4 to 6)	5	5.2.3 Geometric Brownian Motion 5.2.4 Integrated Brownian Motion	K1-K5	2	CO1-CO5	Presentation	<b>III Component – III – Quiz – 15 marks Portion: 4.3- 5.1-5.2.2</b>
Mar 21 - 28, 2025 (Day Order 1 to 6)	5	5.3.1 Using Martingales to Analyze Brownian Motion	K1-K5	5	CO1-CO5	Project assignment	Slip test
Mar 29- April 2, 2025 (Day Order 1 to 3)	<b>REVISION</b>						