

Course Code	MTH371			
Course Name	Stochastic Processes and Applications			
Credits	4			
Course Offered to	UG/PG			
Course Description	This is a second course in Probability Theory and Stochastic Processes. It assumes a background in elementary probability theory which will be reviewed and overviewed initially. The course then develops the necessary mathematics and intuition to understand discrete and continuous stochastic processes. Students will learn not merely results but proofs as well. This will help students firmly understand the underlying mathematics and provide the intuition for setting up a model in a specific application or a problem. These problems can be from diverse fields such as engineering, physics, operations research, economics, finance, or statistics.			
Pre-requisites				
Pre-requisite (Mandatory)	Pre-requisite (Desirable)	Pre-requisite(other)		
MTH 201 (Probability & Statistics)	ECE 501 (Probability and Random Processes)			
*Please insert more rows if required				
Post Conditions*(For suggestions on verbs please refer the second sheet)				
CO1	CO2	CO3	CO4	CO5
Students learn and strengthen their understanding of basics of random variable, and the simplest and most important classes of stochastic processes, namely, Poisson, Gaussian and finite Markov chains.	Students learn about renewal theory which is a generalization of Poisson processes and will thoroughly learn the mathematical foundations of various results.	Students learn about generalization of Markov chains to countable state spaces and continuous time.	Students learn the basics of random walks and martingales, and their applications	Students will learn about real-world applicability of the theory set up.
Weekly Lecture Plan				
Week Number	Lecture Topic	COs Met	Assignment/Labs/Tutorial	
Week 1, 2	Review of probability; Bernoulli process; conditional expectations; moment generating functions; Markov and Chebyshev inequalities; central limit theorem	CO1		
Week 2, 3	Poisson process; Gaussian process; covariance matrices and properties; finite Markov chains	CO1		
Weeks 4, 5, 6	Renewal theory: basics, discrete version, Blackwell and other theorems	CO2		
Weeks 6, 7, 8	Continuous time Markov chains: basics, birth-death chains, reversibility, uniformizability	CO3		
Weeks 9, 10, 11	Random Walks and Martingales	CO4		
Weeks 12, 13, 14	Special topics including real-world applications	CO5		
*Please insert more rows if required				
Weekly Lab Plan				
Week Number	Laboratory Exercise	COs Met	Platform (Hardware/Software)	
*Please insert more rows if required				
Assessment Plan				
Type of Evaluation	% Contribution in Grade			
Homework	20			
Quiz	10			
Mid-sem	30			
End-sem	40			
*Please insert more row for other type of Evaluation				
Resource Material				
Type	Title			
Textbook	Stochastic Processes: Theory for Applications, by Robert G. Gallager			
Textbook	Introduction to Stochastic Processes, Second Edition, by Gregory F. Lawler			
Textbook	Adventures in Stochastic Processes, by Sidney Resnick			