Course No.	Course Name	L-T-P - Credits	Year of Introduction
MA208	Introduction to Stochastic Models	3-1-0-4	2016

Prerequisite: Nil

Course Objectives

- To introduce the modern theory of probability and its applications to modelling and analysis of stochastic systems.
- To learn the important models of discrete and continuous probability distributions and widely used models of stochastic processes such as Poisson processes and Markov chains.
- To know the important applications of stochastic models in engineering as indispensible tools in reliability theory, queuing theory and decision analysis.

Syllabus

Discrete Random variable and Discrete Probability Distribution. Continuous Random variable and Continuous Probability Distribution. Joint distributions. Stochastic Process. Markov chain. Poisson Process.

Expected outcome .

At the end of the course students would have become familiar with quantifying and analysing random phenomena using various models of probability distributions. They would also have learned to use tools of stochastic processes to model and analyse systems evolving randomly in time.

Text Book:

1.Saeed Ghahramani, Fundamentals of probability with stochastic processes, Pearson Education.
2.Hossein Pashro-Nik, Introduction to Probability, Statistics, and Random Processes, Kappa Research, LLC

References:

1.Sheldon M Ross, "Introduction to probability models", Elsavier.
2.Oliver C. Ibe, "Fundamentals Applied Probability and Random processes", Elsevier.
3.Geoffrey R. Grimmett and David R. Stirzaker, "Probability and random processes", Oxford University Press
4.Sundarapandian, "Probability, Statistics and Queuing Theory", Prentice-Hall Of India.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	**Discrete random variables.** Discrete random variables-mean and variance special distributions-binomial, Poisson and Geometric distributions.	9	15%
II	**Continuous random variables.** Continuous random variables-mean and variance special random variables-uniform, exponential and normal.	9	15%
FIRST INTERNAL EXAMINATION			

III	**Joint distributions.** Joint distributions-discrete and continuous. Expectation involving two or more random variables. Independence, correlation and covariance of pairs of random variables, central limit theorem (no proof).	9	15%
IV	**Stochastic Processes.** Stochastic processes-definition and classification, Mean, autocorrelation, cross correlation and their properties, wide sense stationary processes, Ergodic processes.	9	15%
SECOND INTERNAL EXAMINATION			
V	**Markov Chains.** Discrete time Markov chain -Transition probability matrix, Chapman Kolmogorov theorem (without proof), computation of probability distribution, steady state probabilities. Classification of states of finite state chains (using transition diagram only), irreducible and ergodic chains.	10	20%
VI	**Poisson process.** Poisson process-definition based on independent increments property and stationarity, distribution of inter arrival times, Sum of independent Poisson processes, Splitting of Poisson processes.	10	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks : 100 Exam Duration: 3 hours

The question paper will consist of 3 parts.

Part A will have 3 questions of 15 marks each uniformly covering modules I and II. Each question may have two sub questions.

Part B will have 3 questions of 15 marks each uniformly covering modules III and IV. Each question may have two sub questions.

Part C will have 3 questions of 20 marks each uniformly covering modules V and VI. Each question may have three sub questions.

Any two questions from each part have to be answered.