Birla Institute of Technology & Science, Pilani
Hyderabad Campus

SECOND SEMESTER 2019-2020

Course Handout Part II

Date: 06.01.2020

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : MATH F424
Course Title : Applied Stochastic Process
Instructor-in-Charge : Nirman Ganguly, Department of Mathematics

Scope and Objective of the Course: A stochastic process is a random process. The course will enable students to construct predictive models and apply to real situations. Through the course the students will also learn to encapsulate random processes through algorithms.

Textbook:

1. Stochastic Processes-Theory for Applications, Robert G. Gallager, Cambridge University Press , First South Asia Edition 2016.

Reference books

1. Stochastic Processes, 2nd edition, Sheldon M. Ross, Wiley and Sons.
2. A First Course in Stochastic Processes, 2nd edition, Samuel Karlin and Howard E. Taylor, Academic Press.
3. Probability, Random Variables and Stochastic Processes, 4th edition, Athanasios Papoulis and Unnikrishna Pillai, McGraw-Hill.

Course Plan:

Lecture No.	Learning objectives	Topics to be covered	Chapter in the Text Book
1-7	To learn the characteristics of probability models and fundamental inequalities.	Probability Models, Bernoulli process, Expectation , Inequalities , Law of large numbers , Central Limit Theorem.	Sections 1.1 – 1.7
8-14	To understand the definition and implications of Poisson processes.	The Poisson process, Arrival processes, Properties of Poisson Processes, Combination of Poisson processes, Conditional Poisson Processes	Sections 2.1 - 2.5

15-21	To understand Gaussian processes.	Gaussian random variables, Gaussian random vectors, Properties of covariance matrices, Conditional PDFs for Gaussian random vectors, Brownian Motion	Sections 3.1 - 3.5 and 3.6.9
22-28	To compute transition probabilities and their implications in Markov processes.	Definition of Markov chains, Classification of states, The matrix representation, Stochastic matrices, Markov chains with rewards, Applications in programming.	Sections 4.1 – 4.5
29-35	To comprehend countable state Markov chains and application of Renewal theory	Renewal Processes, Renewal reward processes, Countable state Markov chains, Renewal theory applied to Markov chains.	Sections 5.1-5.4 Sections 6.1-6.3
36-42	To gain knowledge of random walks and Martingales	Simple random walks, Integer-valued random walks, Martingales, Scaled Branching processes, Sub-Martingales and Super-Martingales	Sections 9.1, 9.6, 9.7

Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Midsem	90 minutes	30	5/3 3.30 - 5.00 PM	Closed Book
Programming Assignment- I		10	Before Midsem	Open Book
Programming Assignment- II		10	After Midsem	Open Book
Three quizzes will be taken. Best two will be taken into account.	30 minutes for each quiz	10	To be announced through CMS.	Closed Book
Comprehensive	3 Hours	40	11/05 FN	Closed Book

Note: Total marks with all the evaluation components taken together will be 100.

Chamber Consultation Hour: To be announced in class.

Notices: Students will be notified only through CMS.

Make-up Policy: Make-up for any component of evaluation will be given only in genuine cases of absence. [Prior permission is required]

INSTRUCTOR-IN-CHARGE