



**FIRST SEMESTER 2022-2023**

Course Handout Part II

29-08-2022

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.

**Textbook:**

1. Stochastic Processes, 2<sup>nd</sup> edition, Sheldon M. Ross, Wiley and Sons.

**Reference books**

1. A First Course in Stochastic Processes, 2<sup>nd</sup> edition, Samuel Karlin and Howard E. Taylor, Academic Press.
2. Probability, Random Variables and Stochastic Processes, 4<sup>th</sup> edition, Athanasios Papoulis and Unnikrishna Pillai, McGraw-Hill.
3. Stochastic Processes-Theory for Applications, Robert G. Gallager, Cambridge University Press, First South Asia Edition 2016.

**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, Random Variables, Conditional Expectation, Generating Functions, Limit Theorems	Sections 1.1 – 1.8
8-14	To understand the definition and implications of Stochastic and	Essential examples: Random Walks, The Poisson process, Interarrival and Waiting Time Distributions, Compound Poisson	Sections 2.1 - 2.5



	specialty Poisson processes.	Random Variables and Processes	
15-21	To understand Renewal Theory and Discrete Time Markov Chains.	Renewal Theory, Markov Chains, Chapman-Kolmogorov Equations, Classification of States, Gambler's Ruin Problem	Sections 3.1-3.3 Sections 4.1-4.4
22-28	To understand Continuous Time Markov Chains.	Continuous Time Markov Chains, Birth and Death Processes, Computing Transition Probabilities	Sections 5.1 – 5.5
29-35	To gain knowledge of Martingales	Martingales, Stopping Times, Azuma's Inequality for Martingales, Submartingales and Supermartingales	Sections 6.1-6.4
36-40	To comprehend Brownian motions	Brownian motions, Wiener Process, Variations on Brownian Motion	Sections 8.1-8.3

### Evaluation Scheme:

Component	Duration	Weightage (%)	Date & Time	Nature of Component
Mid-Sem	90 minutes	30	31/10 11.00 - 12.30PM	Closed Book
Project- I		10	<b>To be announced through CMS.</b>	Open Book
Project- II		10	<b>To be announced through CMS.</b>	Open Book
Quiz (2)	30 minutes for each quiz	5+5	<b>To be announced through CMS.</b>	Closed Book
Comprehensive	3 Hours	40	17/12 AN	Closed Book

### Note:

1. Total marks with all the evaluation components taken together will be 100.
2. For the 1 credit practical class, related problems will be assigned which will form constituents of Project I and II.

**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]

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.



**INSTRUCTOR-IN-CHARGE**

