INTRODUCTION TO PROBABILITY THEORY AND STOCHASTIC PROCESSES

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INTENDED AUDIENCE : Under-graduate students of electrical engineering, computer engineering, mechanical engineering, civil engineering and mathematics and computing

PRE-REQUISITES : A basic course on Calculus and Linear Algebra

INDUSTRIES APPLICABLE TO : Fractal Analytics, Genpact, Goldman Sachs, FinMechanics, Deutsche Bank and other finance companies.

COURSE OUTLINE :

This course is an explanations and expositions of probability and stochastic processes concepts which they need for their experiments and research. It also covers theoretical concepts of probability and stochastic processes pertaining to handling various stochastic modeling. This course provides random variable, distributions, moments, modes of convergences, classification and properties of stochastic processes, stationary processes, discrete and continuous time Markov chains and simple Markovian queueing models.

ABOUT INSTRUCTOR :

Prof. Dharmaraja earned his M.Sc. degree in Applied Mathematics from Anna University, Madras, India, in 1994 and Ph.D. degree in Mathematics from the Indian Institute of Technology Madras, in 1999. From 1999 to 2002, he was a post-doctoral fellow at the Department of Electrical and Computer Engineering, Duke University, USA. From 2002 to 2003, he was a research associate at the TRLabs, Winnipeg, Canada. He has been with the Department of Mathematics, IIT Delhi, since 2003, where he is currently Head, Department of Mathematics from Sept. 2020 and he is a Professor, Department of Mathematics and joint faculty of Bharti School of Telecommunication Technology and Management from June 2013. Currently, he appointed as 'Institute Chair Professor' from July 2019.During July 2014 and August 2017, he served as Head, Department of Mathematics. He appointed as 'Jaswinder & Tarvinder Chadha Chair Professor' for teaching and research in the area of Operations Research from May 2010 to July 2015. He has held visiting positions at the Duke University, USA, Emory University, USA, University of Calgary, Canada, University of Los Andes, Bogota, Colombia, National University of Colombia, Bogota, Colombia, University of Verona, Verona, Italy, Sungkyunkwan University, Suwon, Korea and Universita degli Studi di Salerno, Fisciano, Italy. His research interests include applied probability, queueing theory, stochastic modeling, performance analysis of computer and communication systems and financial mathematics. He has published over 45 papers in refereed international journals and over 25 papers in refereed international conferences in these areas. He is an Associate Editor of International Journal of Communication Systems and an Associate Editor of Opsearch. He is co-author of a text book entitled "Introduction to Probability and Stochastic Processes with Applications" in John Wiley (US Edition, New Jersey, June 2012) and (Asian Edition, New Delhi, Jan. 2016), co-author of a text book entitled "Financial Mathematics: An Introduction" in Narosa, Nov. 2012 and co-author of a text book entitled "Introduction to Statistical Methods, Design of Experiments and Statistical Quality Control" in Springer (Asian Edition, Sept. 2018).

COURSE PLAN :

Week 01 : Basics of Probability
Week 02 : Random Variable
Week 03 : Moments and Inequalities
Week 04 : Standard Distributions
Week 05 : Higher Dimensional Distributions
Week 06 : Functions of Several Random Variables
Week 07 : Cross Moments
Week 08 : Limiting Distributions
Week 09 : Introduction to Stochastic Processes (SPs)
Week 10 : Discrete-time Markov Chains (DTMCs)
Week 11 : Continuous-time Markov Chains (CTMCs)
Week 12 : Simple Markovian Queueing Models