STOCHASTIC PROCESSES

Instructor Name:

PROF. S. DHARAMRAJA (IIT Delhi - Mathematics)

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COURSE DURATION: Jan-Apr 2018  CORE / ELECTIVE: Elective  UG / PG: UG

PRE-REQUISITES: A basic course on Probability

INTENDED AUDIENCE: Under-graduate, Post-graduate and PhD students of mathematics, electrical engineering, computer engineering

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

COURSE OUTLINE: This course explanations and expositions of stochastic processes concepts which they need for their experiments and research. It also covers theoretical concepts pertaining to handling various stochastic modeling. This course provides classification and properties of stochastic processes, discrete and continuous time Markov chains, simple Markovian queueing models, applications of CTMC, martingales, Brownian motion, renewal processes, branching processes, stationary and autoregressive processes.

ABOUT INSTRUCTOR: S. 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 a Professor, Department of Mathematics and joint faculty of Bharti School of Telecommunication Technology and Management.

N. Selvaraju earned his Ph.D. degree in Mathematics from the Indian Institute of Technology Madras in 2001. From 2001 to 2003, he was a post-doctoral fellow at the Department of Mechanical Engineering (Division of Industrial Engineering), University of Minnesota, USA. He has been with the Department of Mathematics, IIT Guwahati, since 2003, where he is currently a Professor. His research interests are applied probability and stochastic modelling, in particular in the areas of queueing theory, mathematical finance and inventory management in supply chains and has published over 15 papers in international journals and international conferences in these areas.

COURSE PLAN

Week 1: Probability theory refresher 1. Introduction to stochastic process 2. Introduction to stochastic process (contd.)

Week 2: Probability theory refresher (contd.) 1. Problems in random variables and distributions 2. Problems in Sequence of random variables

Week 3: Definition and simple stochastic process 1. Definition, classification and Examples 2. Simple stochastic processes


Week 7: Continuous-time Markov Chains (contd.) 1. M/M/1 Queueing model


Week 9: Martingales 1. Conditional Expectation and filtration 2. Definition and simple examples


Week 12: Branching Processes, Stationary and Autoregressive Processes