

Matrix-Analytic Methods in Queueing Models

Overview

Queueing models play an important role in many industries notably in service sectors. Some of these services are offered via Web. Thus, the arrivals to the service sectors (as well as to other industries) are from different sources and hence to assume that the inter-arrival times are independent is very novice. How do we build correlation into the inter-arrival times but at the same time make the queueing models amenable to practical implementation?

Dr. Marcel Neuts laid the foundation for practical queueing models through the introduction of phase type distributions, versatile Markovian point process (now known as Markovian arrival process), computational probability, and matrix-analytic methods. The answer to the question raised earlier is “through the use of Markovian arrival process and computational probability). Since then, these concepts and methods have been used by several researchers all over the world, and the First International Conferences on Matrix-analytic Methods in Stochastic models was organized by Dr. Srinivas Chakravarthy and Dr. Attahiru Alfa in 1995. The ninth one was recently held in Budapest, Hungary, during June 2016, to point out the importance and the interests in these methods.

The purpose of this series of lectures and tutorials is to expose research scholars, teachers, and industry practitioners to the fundamentals of matrix-analytic methods concepts and tools. Since more complicated queueing models need to be considered in several practical situations, and since the industry & businesses require solutions at a fast rate, the participants of these lectures/tutorials will also be exposed to fundamentals of simulation using powerful simulation software, ARENA. The participants will be highly encouraged to bring their stochastic models to give hands-on experience during the sessions dealing with tutorials.

Course Objectives

The primary objectives of the course are as follows:

- Expose participants to the fundamentals of queues and practical aspects of queues.
- Expose participants to fundamental concepts from Markov chains and phase type distributions.
- Expose participants to Markovian arrival process and matrix-analytic methods in stochastic models.

- Expose participants to simulation tools.
- Enhance participants the usefulness of matrix-analytic methods and simulation through practical examples and useful queueing models.
- Participants will be encouraged to bring their own (practical) queueing models and show them how to apply the tools that they are exposed.

Modules	<p>January 15-25, 2018 (10 days) Total contact hours: 28 hours lectures and 24 hours tutorials</p> <p>Last date of receiving application is on or before December 20, 2017. Number of participants for the course will be limited to thirty five.</p>
Course Outline	<p>Probability Theory and Markov chains, Phase type distributions and Markovian arrival process, Queuing Theory, Matrix-analytic methods in queues, Deterministic/Stochastic Inventory models, Quasi-birth-and-death process, M/G/1-type queues, GI/M/1-type queues, Simulation, Queuing-inventory Systems.</p>
You are eligible to attend if ...	<ul style="list-style-type: none"> • You are a Student, at the levels (M.Sc/M.Phil/Ph.D.) and interested in learning <i>Stochastic Modelling and its Analysis</i> • You are a Post-doc or Faculty from academic/ technical institutions and interested in <i>Stochastic Modelling and its Analysis</i>
Fees	<p>All prospective candidates need to do web portal registration for the course on GIAN (http://www.gian.iitkgp.ac.in/GREGN/index) by making a onetime non-refundable payment of Rs. 500/-</p> <p>After the mandatory web registration, the selected candidates will be intimated by email to register for the course by making full payment of the course registration fee.</p> <p>Registration Fees</p> <p>Participants from abroad: US \$ 500</p> <p>Participants from South Asia: US \$ 300</p> <p>Participants (Students/Post-docs) from India: Rs. 3000/-</p> <p>Participants (Faculties) from India: 3500/-</p> <p>Participants from host Institution: Rs. 1500/-</p> <p>The above fee is towards instructional materials, lunch, tea, snacks etc. Expenses for accommodation and the travel should be borne by participants.</p>

The Faculty



Srinivas Chakravarthy is Professor of Industrial Engineering in the Departments of Industrial and Manufacturing Engineering & Mathematics at Kettering University (formerly known as GMI Engineering & Management Institute), Flint, Michigan, USA. He was department head of Industrial and Manufacturing Engineering during 2013 – 2016.

Srinivas Chakravarthy's research interests are in the areas of algorithmic probability, queuing, reliability, inventory, Healthcare Modelling and simulation. He has published more than 100 papers in leading journals and made more than 90 presentations at national and international conferences. His recognitions and awards include Distinguished Faculty, 2015 (inducted into Kettering's Faculty and Alumni Honour Wall), National Science Foundation Awards, Rode's Professor, Kettering University, Kettering University Distinguished Research Award, Kettering University/GMI Alumni Outstanding Teaching Award, GMI Outstanding Research Award, and GMI Alumni Outstanding Teaching Award, and Educator of the Year Award by IEOM Society, 2016. He has significant industrial experience by consulting with GM, FORD, PCE, and UPS. His professional activities include serving as (a) Area Editor for the journal, *Simulation Modelling Theory and Practice*; (b) Advisory Editor for *Queueing Theory and Service Management*; (c) Associate Editor for the journal *IAPQR TRANSACTIONS - Indian Association for Productivity, Quality & Reliability*; (d) Advisory Board Member for several other journals and international conferences; and (e) Reviewer for many professional journals.



Professor A. Krishnamoorthy is an UGC Emeritus Fellow & Honorary Director of Centre for Research in Mathematics at CMS College, Kottayam and he was formerly Professor of Mathematics in the Department of Mathematics at CUSAT. He is the Principal Investigator of the Indian team in the DST sponsored Indo-Russian bilateral research collaboration (jointly with Russian Academy of Sciences). He has produced 30 PhD's and published over 130 research papers in national/international SCI/SCOPUS indexed journals. He serves as: Chief Editor of *Bulletin of Kerala Mathematical Association*, Advisory Editor of *Queueing Models and Service Management*, Deputy Editor of *Electronic Journal of Reliability: Theory & Applications* and Reviewer of many world class journals. He also serves as advisory board member for several journals and international conferences.

Course Coordinator



Manikandan Rangaswamy is currently working as an Assistant Professor in the Department of Mathematics at Central University of Kerala, Kasaragod, India. He obtained his Doctoral degree from Cochin University of Science and Technology (CUSAT), Cochin, India. After obtaining his Doctoral degree he joined as a Post-Doctoral Fellow in the Department of Mathematics at Indian Institute of Science, Bangalore, India. He was also a Visiting Scientist at Indian Statistical Institute Bangalore, India. His research interests primarily lie in Stochastic Modelling & Analysis of Queuing/Inventory/Reliability Systems, Stochastic Control, Markov Decision Process and Applications of Stochastic Games in Queues.

Course Coordinator

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If you do not yet have a GIAN account, you are required to register paying a nominal fee Rs. 500/- at the web page :

<http://www.gian.iitkgp.ac.in/GREGN>