MANIPAL UNIVERSITY JAIPUR

International Summer School Manipal University Jaipur [ISSMUJ]-2022

[Hybrid Mode]

Course/Project Overview

Name of Course: Advanced Queueing Models

Name of instructor: Dr. Anamika Jain.
Session: June-July 2022
Language of instruction: English
Number of contact hours: 36
Credit awarded: 03

Objective of Course

This course is offered by Dept. of Mathematics & Statistics as a Summer course work, targeting students who wish to pursue Research and Higher Studies in Mathematics. It offers in depth knowledge of queueing problems, measures of effectiveness, common areas and applications, probability distributions, Stochastic processes and Markov process, Markovian queueing models and advanced queueing models. Students are expected to have background knowledge on approximation and numerical techniques.

Syllabus

Queueing Process: Basic Concepts, Description of queueing problem, Characteristics of queueing problems, Measures of effectiveness, Common areas and applications, Probability Distributions including Poisson and the exponential distributions, Markovian properties of the exponential distribution, Stochastic Processes and Markov chains, Birth-death processes. **Markovian Queueing Models:** Steady state and transient solution for the M/M/1, M/M/1/k, M/M/1/∞ models, Little's formula, Measures of effectiveness; Multi server queues (M/M/c, M/M/c/k, M/M/c/c, M/M/∞); Finite source queues; Queue with impatience; Waiting time distribution and busy period distributions for M/M/1 Model. **Advanced Queueing Models:** Bulk input queue ($M^{[x]}$/M/1), Bulk service queue (M/$M^{[y]}$/1); Priority queues; Markovian Retrial queues; Vacation queues; **Approximation and Numerical Techniques:** Steady state solution for stationary equations, Gauss Seidel and successive over relaxation methods, Matrix Geometric Method, Range Kutta Method.

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Organization of course

Total contact hrs 36		
1st week:	10 hrs (classes)	2 hrs (self-study/project)
2nd week:	10 hrs (classes)	2 hrs (Mid term exam/assessment/discussion)
3rd week:	10 hrs (classes)	2 hrs (End term exam)

Mode of lectures: online lecture/online videos/case study/ discussion/ workshop/ hands-on

Course/Project Plan

Lecture no.	Topic	Lecture mode	Instructor
L: 1-6	**Queueing Process:** Basic Concepts, Description of queueing problem, Characteristics of queueing problems, Measures of effectiveness, Common areas and applications, Probability Distributions including Poisson and the exponential distributions,	Lecture, Discussion & Examples	Dr. Anamika Jain
L: 7-12	Markovian properties of the exponential distribution, Stochastic Processes and Markov chains, Birth-death processes	Lecture, Discussion & Examples	Dr. Anamika Jain
L: 13-18	**Markovian Queueing Models:** Steady state and transient solution for the M/M/1, M/M/1/k, M/M/1/∞ models, Little's formula, Measures of effectiveness;	Lecture, Discussion & Examples	Dr. Anamika Jain
L: 19-24	Multi server queues (M/M/c, M/M/c/k, M/M/c/c, M/M/∞); Finite source queues; Queue with impatience; Waiting time distribution and busy period distributions for M/M/1 Model.	Lecture, Discussion & Examples	Dr. Anamika Jain
L: 25-30	**Advanced Queueing Models:** Bulk input queue ($M^{[x]}$/M/1), Bulk service queue (M/$M^{[y]}$/1); Priority queues; Markovian Retrial queues; Vacation queues;	Lecture, Discussion & Examples	Dr. Anamika Jain
L: 31-36	**Approximation and Numerical Techniques:** Steady state solution for stationary equations, Gauss Seidel and successive over relaxation methods, Matrix Geometric Method, Range Kutta Method.	Lecture, Discussion & Examples	Dr. Anamika Jain

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Brief profile of the instructor

Anamika Jain is working in Manipal University Jaipur, India at the post of Assistant Professor (Selection Grade) in the Department of Mathematics and Statistics. She earned Post-graduate and Doctoral degree in Mathematics from St. John's College, Agra (India). She is presently involved in research in the area of probability models, queueing theory and reliability engineering. She will be responsible to modelling and implementation of optimization tool and techniques. She is teaching various courses to undergraduate and graduate students and also doing projects to M.Tech and B.Sc students.