

# Queuing Systems - Web course

## COURSE OUTLINE

Introduction, Markov Chains and Markov Processes, Birth-Death Processes, Simple Queueing Models (M/M/-/ Queues), Queues with Batch Arrivals, M/G/1 Queue with Residual Life and Imbedded Markov Chain Approach, Queues with Vacations, Bulk Arrivals and Priorities, Discrete Time Queues, Delay Analysis of Queues.

Fundamentals of Queueing Networks, Open and Closed Queueing Networks, Open Networks of M/M/m type queues and Jackson's Theorem, MVA and Convolution Algorithm for Closed Networks, Approximate Models for Open and Closed Queueing Networks, Queueing System Applications, Simulation Modeling of Queueing Systems.

## COURSE DETAIL

Module No.	Topic/s
1	Introduction to Queues and Queueing Theory.
2	Stochastic Processes, Markov Processes and Markov Chains, Birth-Death Process.
3	Basic Queueing Theory (M/M/-/ Type Queues.
4	Departure Process from M/M/-/ Queue, Time Reversibility, Method of Stages, Queues with Bulk Arrivals.
5	Equilibrium Analysis of the M/G/1 Queue.
6	Analyzing the M/G/1 Queue using the Method of Supplementary Variables.
7	M/G/1 Queue with Vacations.
8	$M^{[x]}$ /G/1 Queue.
9	Priority Operation of the M/G/1 Queue.
10	M/M/n/K Queue with Multiple Priorities.



NP-TEL

# NPTEL

<http://nptel.iitm.ac.in>

## Electronics & Communication Engineering

### Pre-requisites:

1. Adequate knowledge of undergraduate mathematics.

### Additional Reading:

1. T.G. Robertazzi, Computer Networks and Systems - Queueing Theory and Performance Evaluation, Springer 2000.
2. L. Kleinrock, Queueing Systems Volume 1 : Theory, Wiley 1975.

### Hyperlinks:

1. <http://www.iitg.ernet.in/skbose/qbook/qbook.html>.

### Coordinators:

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11	M/G/1/K Queue.
12	G/M/1, G/G/1 G/G/m, and M/G/m/m Queues.
13	Queueing Networks - Classification and Basic Concepts.
14	Open and Closed Networks of M/M/m Type Queues, Jackson's Theorem.
15	Analysis of Closed Queueing Networks using Convolution and Mean Value Algorithms.
16	Norton's Theorem for Closed Queueing Networks, Mixed Queueing Networks, Queueing Network Analyzer (QNA) Approach.
17	Simulation Techniques for Queues and Queueing Networks.
18	Discrete Time Queues.

**References:**

1. Donald Gross, James M. Thompson, John F. Shortle and Carl W. Harris, Fundamentals of Queueing Theory, Wiley 2008.
2. Sanjay K. Bose, An Introduction to Queueing Systems, Springer 2002.