

**ECE 595-008: ST: Stochastic Processes: “Queuing theory with applications to modern communication networks”**

Spring 2017, MW: 11:00-12:15; Room ECE215

Instructor: Prof. Majeed M. Hayat [[hayat@unm.edu](mailto:hayat@unm.edu)]

**Objective:** To learn intermediate Markov chain theory and queuing theory and apply them to modern communication networks.

**Prerequisite:** ECE 541 or equivalent

**Text:** Mor Harchol-Balter, *Performance Modeling and Design of Computer Systems: Queueing Theory in Action*. Cambridge University Press (discount code: L3PMDCS), 2013, ISBN: 9781107027503

**Topics:**

**Discrete-time Markov chains** (3 weeks)

- Basic properties, recurrence, strong recurrence, Kolmogorov equations, stationary distributions, ergodic theory for Markov chains
- Application to queuing problems

**Continuous-time Markov chains** (2 weeks)

- Basic properties, balance equations, stationary distributions
- Application to continuous-time queuing problems
- Renewal theory and key limit theorems

**Application to communication networks** (10 weeks)

I will follow the author’s suggestions.

- Chpt 14 (M/M/k and M/M/k/k)
- Chpt 15 (Capacity Provisioning)
- Chpt 16 (Networks of queues)
- Chpt 17 (Networks of queues)
- Chpt 18 (Networks of queues)
- Chpt 20 (Heavy tailed workloads)
- Chpt 23 (M/G/1)
- Chpt 24 (Task Assignment in Server Farms)
- Chpt 28 (Scheduling in M/G/1)
- Chpt 29 (Scheduling in M/G/1)
- Chpt 30 (Scheduling in M/G/1)
- Chpt 31 (Scheduling in M/G/1)
- Chpt 32 (Scheduling in M/G/1)
- Chpt 33 (Scheduling and Fairness)

**Course requirements:** Weekly homework problems, class discussions.