MAP 4260 Introduction to Queueing Theory

Credits: 3

Text book, title, author, and year: *Introduction to Queueing Theory*, by Robert B. Cooper, North Holland, 2nd Edition, 1981.

a. **Supplemental materials:** http://www.vimeo.com/album/171324

Specific course information

a. **Catalog description:** Queueing theory and its application to computer performance evaluation, operating systems analysis, telecommunication, and operations research
b. **Prerequisites:** STA 4821
c. **Required, elective, or selected elective:** elective

Specific goals for the course

a. Specific outcomes of instruction: The primary goal is to show how to use the theory of probability to describe and predict the behavior of real systems (computer and telecommunications networks, others) that use fixed resources to handle random demands (thereby enabling engineers to make design tradeoffs between cost and quality of service). In the process, we examine the relationship between mathematical models (precise formulas but limited applicability) and their corresponding simulation models (imprecise experimental data, but greater flexibility and realism). Since the models are simple descriptions of real systems, they are quite intuitive; but since they are driven by random inputs, their performance can be quite counterintuitive. Thus, we will show, the subject is both practically useful and intellectually interesting.

Brief list of topics to be covered:

- Introduction (historical background, summary of technology and economics)
- Intuitive analysis of mathematical models, subtleties
- Review of probability, simulation via inverse transform
- Introduction to stochastic processes
- One-dimensional birth-and-death processes, related queueing models
- PASTA, Little's theorem, insensitivity
- Erlang B and Erlang C models, finite-source models
- Multidimensional birth-and-death processes, networks of queues and related models
- Imbedded Markov chains, M/G/1 queues, vacation and polling models, related models