MAP 6264 QUEUEING THEORY

Catalog Description:

Prerequisite: STA 4821 Stochastic Models for Computer Science
Development of mathematical models for performance analysis of computer and telecommunications networks. Review of probability, introduction to stochastic processes, development of classical teletraffic and queueing models, application to modern computer and telecommunications networks.

Instructor:

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Course website: www.cse.fau.edu/~bob/courses/map6264

Method of Instruction:

The course will be taught in the "reverse classroom" mode: The students will be assigned to watch recorded lectures. The live class, which will be recorded via Echo for distance-learning students, will be used to answer questions and to enlarge on the recorded lectures.

These lectures were previously recorded for a distance-learning version of the course that was taught in 2006, and they are available on Vimeo and YouTube. They have been used many times for Independent Study. A student should be able to take the course solely by viewing these online lectures (which are augmented by a lecture-by-lecture summary that is posted on the course website). Viewing the Echo recordings of the live class and, especially, attending the live class, are encouraged.

Textbook:

Cooper, R.B. INTRODUCTION TO QUEUEING THEORY, Second Edition, North Holland, 1981 (ISBN 0-444-01065-3); SOLUTIONS MANUAL (by B. Tilt, ISBN 0-444-00379-7).
Both available free from course website.

References:

Full-screen videos of Spring 2006 lectures on whiteboard, available online at Vimeo and YouTube.
Vimeo: http://www.vimeo.com/album/171324
YouTube: https://www.youtube.com/playlist?list=PL59NBu6N8dUqYClaKpoozyzK3Kpcm5eou

Bertsekas, D. and R. Gallager. DATA NETWORKS, 2nd Ed., Prentice Hall, 1992 (ISBN 0-13-200916-1 paperback).
Available at http://web.mit.edu/dimitrib/www/datanets.html

Ross, S.M., INTRODUCTION TO PROBABILITY MODELS, any edition, Academic Press (10th Ed., ISBN 978-0-12-375686-2).

Tijms, H.C., A FIRST COURSE IN STOCHASTIC MODELS, Wiley, 2003 (ISBN 0-471-49881-5 paperback).

Myron Hlynka's Queueing Theory Page: http://web2.uwindsor.ca/math/hlynka/queue.html

Goals:

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, this subject is both practically useful and intellectually interesting.

Rules:

Homework problems will be assigned, but only specifically-designated assignments will be graded. Students are allowed to "consult" (to be defined in class) on homework problems. Course grades will be based on the graded homeworks and a take-home exam.

Topics:

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