# Course Syllabus
# EE 549 – Queueing Theory
# USC, Spring 2007

## I. Course Information

*Instructor:*

Michael J. Neely (EEB 520, mjneely@usc.edu, 213-740-3505)
Office Hours: Monday 11:05am-1:05pm, Tuesday 10:00am-12:00pm

*Teaching Assistant:*

Rahul Urgaonkar (urgaonka@usc.edu)
Office Hours: Date and Location TBA

*Class Location and Time:*

OHE 100C, Monday/Wednesday 9:30am-10:50am

*Electronic Documents and DEN:*

Electronic documents for this course will be routinely available on the DEN website: http://den.usc.edu/

*Textbook:*

This course will use a combination of instructor handouts, lecture notes, and the following textbook:

- *Introduction to Probability Models* by Sheldon Ross ($8^{th}$ edition)

For students interested in supplemental reading, the following queueing theory texts are recommended (but not required):

1) Chapter 3 of *Data Networks* by D. Bertsekas and R. Gallager (Little's Law, Reversibility, and M/G/1 systems)
2) *Discrete Stochastic Processes* by R. Gallager (Renewal Theory and Markov Chains)
3) *Queueing Systems*, Vol. 1, by L. Kleinrock (M/G/1, G/M/1 systems, transients, emphasizes transform methods)

*Grading:*

There will be problem sets, 2 quizzes, and a final exam, to be weighted in an overall score as follows:
Homework: $15\%$, First Quiz: $25\%$, Second Quiz: $25\%$, Final: $35\%$
The following minimum letter grades are guaranteed to students scoring within the specified intervals:
85-100 A, 70-85 B, 55-70 C, 40-55 D
The above thresholds may be adjusted at the end of the semester at the discretion of the instructor.
Any such adjustments will be in favor of a higher letter grade.

*Exam Dates and Times:*

Quiz 1: Wednesday, Feb. 14, 9:30am-10:50am
Quiz 2: Wednesday, April 4, 9:30am-10:50am
Final Exam: Friday, May 4, 8am-10am

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## II. TENTATIVE COURSE OUTLINE:

*Sample Path Analysis*

Jan. 8, 10 — Intro to Queueing Dynamics, Multiplexing and Tracking Theorems

Jan. 17 — Join-the-Shortest-Queue, Law of Large Numbers, Rates (note: no class on Jan. 15, Martin Luther King Day)

Jan. 22, 24 — Rate Stability, Leaky Bucket Envelopes, Network Calculus

Jan. 29, 31 — Worst Case Delay Analysis, Traffic Filters, Priority Service

Feb. 5, 7 — Minimum Clearance Time Algorithms, Application to Wireless Downlinks and Packet Switches

Feb. 12 — Little's Theorem

Feb. 14 — Quiz 1

*Discrete Time Queueing*

Feb. 21 — Bernoulli Queues and Steady State Analysis (note: no class on Feb. 19, President's Day)

Feb. 26, 28 — Markov Chains, Global and Local Balance Equations, Stationarity and Finite State Coupling

March 5, 7 — Discrete Reversibility

March 12, 14 — Spring Break

*Continuous Time Queueing*

March 19, 21 — Transform Methods for (discrete time) Queues, Poisson Process, Random Sampling, PASTA

March 26, 28 — M/M/m systems, Finite buffer systems

April 2 — Continuous Time Reversibility, Jackson Networks

April 4 — Quiz 2

April 9, 11 — Renewal Theory and M/G/1 Queues, Inspection Paradox

April 16, 18 — Queues with Vacations, Busy Periods

April 23, 25— Equivalent Models for Tree Networks, Special Topics

May 4 — Final Exam (8am - 10am)