Syllabus: Stochastic Models I (IEOR E6711), Fall 2009

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Tuesdays and Thursdays : 7:10PM–8:25PM, Room 333 Uris Hall (Business School).

Prerequisites: Graduate-level (non-measure theoretic) probability theory such as SIEO W4105 or the equivalent.

A first-semester Ph.D.-level course (but at a non-measure theoretic level). Advanced treatment of stochastic modeling in the context of queueing, reliability, manufacturing, insurance risk, financial engineering and other engineering applications. Review of elements of probability theory; exponential distribution; renewal theory; Wald's equation; Poisson processes. Introduction to both discrete and continuous-time Markov chains.

Further possible topics might be introduced, time-permitting, such as a brief introduction to Brownian motion, and a brief introduction to stochastic simulation.
TEXT: No specific text will be used, detailed course notes will be made available on the course web site; but the following three textbooks are good references:

References

[1] S. Ross (1996). *Introduction to Probability Models*, 9th Edition, Academic Press, New York

[2] Karlin and Taylor (1975). *A First Course in Stochastic Processes*, Second Edition, Academic Press

[3] S. Ross (1996). *Stochastic Processes*, Second Edition, Wiley, New York

[1] is a lower level book than the other two, but contains chapters devoted to much of the material we will cover (Markov Chains, Poisson Processes, Renewal Theory...), and does so more in line with the order that we will cover the material. The main difference between the level in [1] and the level we will cover is that you will be expected to learn some rigorous proofs of some results and theorems, as opposed to only using the results and theorems in applications; [2] [3] are more "proof" oriented.

During the first two weeks we will cover a "Review of Probability" and begin an "Introduction to discrete-time Markov chains". The Markov chain material is covered in Chapter 4 of [1], Chapters 2 and 3 of [2], and Chapter 4 of [3]. As our next topic, we will start with the Poisson process and move into the study of continuous-time Markov chains. This is covered in Chapters 5 and 6 in [1], Chapter 4 of [2], and Chapters 2 and 5 of [3].

Course requirements: Two (2) in-class midterm exams (each 30%) and an in-class final exam (40%) will be required. Homework will be assigned on a regular basis but will not count towards a grade (solutions will be posted). The first midterm exam will cover discrete and continuous-time Markov chains and some basic probability theory, and parts of (specifics TBA). Information concerning the other two exams will be given in due course.