CMPE 548 Analysis of Computer Communication Networks (Fall 2007)

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Office Hours: TBA

Textbooks: [T03] Henk C. Tijms, *A First Course in Stochastic Models*, Wiley, 2003.
[KMK04] A. Kumar, D. Manjunath, and J. Kuri, *Communication Networking: An Analytical Approach*, Elsevier, 2004.

Prerequisite: No official prerequisite. However, you **must** have a strong background in elementary probability theory.

The primary objective of this course is to present mathematical models and methods that are used to analyze computer communication networks at the graduate level. Both theory and applications will be emphasized. The course will build upon the concepts introduced in probability theory and computer networks courses.

Course Description: Advanced topics in analysis of communication networks. Topics include Markov processes, renewal theory, queues, stochastic networks, network calculus, routing and congestion control, utility functions, max-min and proportional fairness.

Related Courses: You may also consider taking *EE 571 Probability Theory and Stochastic Processes*, *CMPE 542 Advanced Networking*, *CMPE 547 Queueing Networks for Computer Applications*, and *CMPE 576 Advanced System Simulation* in conjunction/in the sequel.

Important Dates: Midterm: Week of Nov. 12–16, 2007; Final: Week of Jan. 2–4, 2008.

Grading Policy: Midterm 40%, Final 40%, Homework 20%

Make-Up Policy: Only one **comprehensive** make-up examination will be given to those who miss any of the midterm or the final. The make-up exam will be given to only those who provide a valid excuse in writing within the next three working days following the missed exam. This rule is a University by-law, and I **will** enforce it. Students who miss an exam due to a serious medical condition are required to provide official documentation (doctor's report approved by the Student Health Center). However, eligibility to take the make-up exam will still be **subject to my approval**.

Academic Dishonesty: Any conduct that attempts to gain unfair academic advantage is considered academic dishonesty. Copying assignments, cheating during exams, substituting for another person are some examples of academic dishonesty. Cases of academic dishonesty **will not** be tolerated and will be punished according to EMU's disciplinary policies.

Tentative outline: Below is a tentative outline for this course. I reserve the right to adjust the pace and topics of the class as the semester progresses.

Week 1	Introduction
Week 2	The Poisson process ([T03] Ch. 1)
Week 3	Renewal-reward processes ([T03] Ch. 2)
Weeks 4 & 5	Discrete-time Markov chains ([T03] Ch. 3)
Week 6	Continuous-time Markov chains ([T03] Ch. 4)
Week 7	Queues ([T03] Ch. 5)
Week 8	Stochastic networks ([T03] Ch. 5)
Weeks 9 & 10	Review & Midterm week
Weeks 11 & 12	Deterministic network analysis: network calculus ([KMK04] Ch. 4)
Week 13	Stochastic traffic models: bufferless multiplexing ([KMK04] Ch. 5)
Week 14	Stochastic traffic models: arbitrary buffering, effective bandwidths ([KMK04] Ch. 5)
Week 15	Bandwidth sharing: Max-min fairness, utility functions ([KMK04] Ch. 7)

Additional references:

- D. Bertsekas and R. Gallager, *Data Networks*, 2nd ed., Prentice Hall, 1991.
- L. Kleinrock, *Queueing Systems*, vol. 1 & 2, Wiley, 1975-76.
- A. Papoulis and S. U. Pillai, *Probability, Random Variables and Stochastic Processes*, 4th ed., McGraw Hill, 2002.