STAT 650 - Applied Stochastic Processes - Spring 2014

Course Syllabus

Textbook: Samuel Karlin and Howard M. Taylor, "*A First Course in Stochastic Processes*", 2nd ed., Academic Press, ISBN 0-12-398552-8.

Time and Place: TuTh 2:00 - 3:15 PM, MTH 0411

Prerequisites: STAT 410 or consent of the instructor

Instructor: Prof. Abram Kagan

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STAT 650 is an introduction to basic classes of stochastic processes presented in a mathematically rigorous form and illustrated by examples mainly from engineering and biology.
Solving problems is absolutely necessary for understanding the material. Homeworks will be assigned and graded. Two in class midterms and possibly one take home midterm will be given. The **tentative** dates of the in class exams are Thursday, February 27 and Thursday, April 17.
The students are responsible for all the material covered in class.

Course Outline

Random vectors

1. Joint and marginal distributions, Characteristic functions, Moment generating functions, Laplace transformation.
2. Conditional distribution and conditional expectation.
3. Multivariate normal and multinomial random vectors/distributions.
4. Different form of convergence of random vectors.
5. Chebyshev's inequality, Law of Lagre Numbers, Central Limit Theorem, Borel-Cantelli Lemma.

Markov chains

1. Transition probability matrices. Examples.
2. Classification of states.
3. Periodicity and recurrence.

Limit theorems for Markov chains and applications

1. Stationary distributions.
2. Absorbtion probabilities.
3. Conditions for recurrence.
4. Applications to queueing models.

Continuous time Markov chains

1. Poisson processes.
2. Birth and death processes.
3. Kolmogorov equations.

Renewal processes

1. Definitions and examples.
2. Renewal equations and the elementary renewal theorem.

Introduction to stationary processes (if time allows)