OPRE 6330, Applied Probability and Stochastic Processes—Fall 2003

Tuesdays, 7:00pm–9:45pm
Room: SOM 2.801

Instructor:

Shun-Chen Niu

Office:	SOM 3.201
Office Hours:	Tuesdays, 4:00pm–6:00pm
Telephone:	972-883-2707
E-mail:	scniu@utdallas.edu
WWW Home Page:	http://www.utdallas.edu/~scniu/

Texts:

The required text is: *Introduction to Probability Models*, by Sheldon M. Ross, 8*th* Edition. Academic Press, 2003.

In addition, I also recommend: *Stochastic Processes*, by Sheldon M. Ross, 2*nd* Edition. John Wiley & Sons, 1996.

Prerequisites:

Calculus and Analytic Geometry; or consent of the instructor.

Course Description:

The first part of the course covers basic concepts and methods from probability theory. Students are expected to gain a working knowledge in probability. In the second part of the course, we will cover a number of important classes of stochastic processes that are useful in the modeling of complex systems. These include Poisson and renewal processes, discrete and continuous-time Markov chains, and semi-Markov processes.

Grading Scheme:

Homework:	20%
Midterm:	40% (October 14)
Final:	40% (December 2)

Course TA:

Xianghua Gan

Office:	SOM 3.406
E-mail:	ganxh@utdallas.edu

Course Outline:

1. Introduction to Probability

    (a) Sample Space and Events

   (b) Definition of Probability and Conditional Probability
   (c) Independence

2. Random Variables
   (a) Definition and Types of Random Variables
   (b) A Survey of Important Discrete Random Variables
   (c) A Survey of Important Continuous Random Variables
   (d) Expectation
   (e) Basic Limit Theorems

3. Conditional Probability and Conditional Expectation
   (a) The Conditional Distribution of a Random Variable
   (b) Various Uses of Conditional Expectations

4. The Exponential Distribution and the Poisson Process
   (a) Definition and Basic Properties of the Exponential Distribution
   (b) Various Definitions of the Poisson Process and Its Relation to the Exponential Distribution
   (c) Conditional Arrival Times of a Poisson Process and Other Properties
   (d) Nonhomogeneous and Compound Poisson Processes

5. Continuous-Time Markov Chains
   (a) Definition and Basic Properties
   (b) Kolmogorov Differential Equations
   (c) Steady-State Results

6. Renewal Theory
   (a) Definition and Basic Properties
   (b) Renewal-Type Equations
   (c) Limiting Results and Some Applications
   (d) Regenerative Processes — A Generalization

7. Markov Chains
   (a) Definition, Basic Properties, and Classification of States
   (b) Connection to Renewal Theory
   (c) Limiting Results
   (d) Semi-Markov Processes (or Markov-Renewal Processes) — A Generalization