NEW YORK UNIVERSITY
NYU STERN
LEONARD N. STERN SCHOOL OF BUSINESS

Introduction to Stochastic Processes

STAT-GB.3321/STAT-UB.0021

Monday: 6:00-9:00 pm

Fall 2017

Basic information

Instructor:	**Professor Halina Frydman**
Office:	**KMC 8-55**
Telephone:	**(212) 998-0453**
E-mail:	**hfrydman@stern.nyu.edu**
Classroom:	
Office hours:	**Monday: 4:45-5:45 pm and by appointment**
Grader:	
E-mail:	

Course outline

This is an introductory course in stochastic processes. The course covers theory of discrete and continuous Markov chains, martingales and Brownian motion and its generalizations. The discussion of Markov chains includes statistical aspects of these processes. If time permits, the idea of stochastic integration is introduced and rules of stochastic calculus are developed. The objective of the course is for you to learn about basic classes of stochastic processes and their applications. The topics are covered in the following order:

1. Discrete time Markov chains
2. Continuous time Markov chains
3. Discrete time martingales
4. Brownian motion and its generalizations
5. Elements of stochastic calculus

Prerequisites

The prerequisites for the course are Calculus I and a course in probability theory

Course Materials

Lecture Notes

Textbook: Introduction to Probability Models (11th edition) Sheldon M. Ross, Academic Press 2014.

Topics and readings

- Discrete time Markov chains
  - Ross: 4.1-4.6
  - Lecture notes: Chapter 1
- Continuous time Markov chains
  - Ross: 5.3.1-5.3.5
  - Ross: 6.1-6.5 and 6.8
  - Lecture notes: Chapter 2
- Discrete time martingales
  - Lawler: 5.1-5.3
  - Lecture notes: Chapter 3
- Brownian motion and its generalizations
  - Ross: 10.1-10.3
  - Lecture notes: Chapter 4
- Elements of stochastic calculus
  - Lecture notes: Chapter 5
  - Lawler: 9.1-9.3

Additional Readings

The following additional books are useful references to topics covered in the course. The third and the fifth topic use the material from Lawler. The remaining references are sources of interesting examples of Markov processes that we study in the course.

1. **Introduction to Stochastic Processes** (Second Edition), G.F. Lawler, Chapman and Hall, Probability Series, 2006.
2. **An Introduction to Stochastic Modeling**, H.M. Taylor and S. Karlin, Academic Press, Third Edition.
3. **A First Course in Stochastic Processes** (Second Edition), Samuel Karlin and Howard M. Taylor, Academic Press, 1975.
4. **Adventures in Stochastic Processes**, S. Resnick, Birkhauser, (1992).
5. **Elementary Stochastic Calculus with Finance in View,** Thomas Mikosch, Advanced Series on Statistical Science & Applied Probability, World Scientific, 1999.
6. **Stochastic Processes,** (2nd Edition) Wiley, S. Ross, 1996.

Grading

Homework 35%

Midterm 35%

Final 30%

Participation and Class Attendance

Participation is an essential part of learning in this course and the way I get to know you.
Class absences may be excused only in the cases of documented illness, family emergency, religious observance or civic duty. If you will miss the class for religious observance or civic duty you must inform me no later than the first week of class.

Students are expected to arrive to class on time and stay to the end of the class period.

Classroom Norms

Cell phones, laptops and similar electronic devices are a disturbance to both students and professors. All such electronic devices must be turned off prior to the start of each class meeting.

Academic Integrity

Integrity is critical to the learning process and to all we do here at NYU Stern. All undergraduate students are expected to follow the Stern Code of Conduct http://www.stern.nyu.edu/uc/codeofconduct, which includes a commitment to:

Exercise integrity in all aspects of one's academic work including, but not limited to, the preparation and completion of exams, papers and all other requirements or means that provides an unfair advantage.

Clearly acknowledge the work and effort of others when submitting work as one's own. Ideas, data, direct quotations, paraphrasing, creative expression, or any other incorporation of the work of others must be clearly referenced.

Refrain from behaving in ways that knowingly support, assist or in any way attempt to enable another person to engage in any violation of the Code of Conduct. You have an obligation to report any observed violation.

Students with disabilities

Students whose class performance may be affected due to a disability should notify the professor immediately so that arrangements can be made in consultation with the Henry and Lucy Moses Center for Students with Disabilities http://www.nyu.edu/csd/ to accommodate their needs.