

MATH 5110: INTRODUCTION TO STOCHASTIC PROCESSES

SPRING 2015
LAST UPDATE: JANUARY 13, 2015

Class: Tuesday, Thursday, 2:00pm—3:15pm in Gilmer Hall, 166.

Instructor: Leonid Petrov

Office: 209 Kerchof Hall

Preferred email for the course: lenia.petrov+5110s15@gmail.com (if using any of my other email addresses, put the tag **5110s15** somewhere in the subject!)

Office hours: Tuesday: 12:00pm–1:30pm; Thursday: 11:00am–12:30pm

or by appointment (I encourage you to make as many appointments as you need if you have a scheduling conflict with my official hours. The preferred way to make them is by email.)

Prerequisites for the course: Familiarity with topics from MATH 3100 (or equivalent probability course) and knowledge of linear algebra, or instructor's consent.

Topics:

- Fundamental elements of stochastic processes
- Markov chains
- Random Walks and Brownian motion
- Martingales
- Other topics (TBA)

Among many interesting topics in the course, we'll learn a way to answer questions like

If two immortal people were placed on the opposite sides of an uninhabited Earthlike planet, how long would it take them to find each other if they're moving at random? (see picture on the right; question is inspired by "What If?" book by Randall Munroe)



Trajectories of two independent random walkers on (invisible) sphere: when the walkers will be *in the same place at the same time*?

Main textbook:

The basic reference for the course is

- G. F. Lawler, Introduction to Stochastic Processes, 2nd ed, Chapman and Hall, New York.

Additional books:

The main textbook may be complemented by additional materials on selected topics. At your option, it may also be complemented by the following good fundamental references (containing many examples):

- R. Durrett, Essentials of Stochastic Processes, 2. ed., Springer
- S. Karlin and H. M. Taylor, A First Course in Stochastic Processes, Academic Press.
- J. Norris, Markov Chains, Cambridge University Press, 1997.

There is also a free (GNU Free Documentation License) textbook containing some nice examples:

- C.M. Grinstead and J.L. Snell, Introduction to Probability, http://www.dartmouth.edu/~chance/teaching_aids/books_articles/probability_book/book.html

Learning:

The best way to learn the subject it is to do the homework problems every week. Please ask me questions about things you do not understand, either in class or in my office. **DON'T wait until you feel completely lost!**

Grading:

Homeworks will be assigned **and collected** each week. Some of them may be graded.

Your course grade will be based on **quizzes/mini-exams** (see dates below). The quiz material will come from homeworks. There is no final exam.

Collaboration, independent work, honor code:

You are encouraged to work together to learn material and prepare for quizzes. Teams of two work very well. Most mathematicians work in pairs to take advantage of the challenge-defend discussions that help us understand things better. Of course, some learning will also require independent work, such as reading assignments and some practice problems.

You are required to work independently on the quizzes. So when working together with others, make sure you are preparing yourself to take the quiz independently.

The honor code is taken seriously. Any honor code violations pertaining to the quizzes will be automatically referred to the Honor Committee.

Classes schedule:

week 1. 1/13, 1/15

week 2. 1/20, 1/22*

week 3. 1/27, 1/29

week 4. 2/3*, 2/5

week 5. 2/10*, 2/12

week 6. 2/17*, 2/19

week 7. 2/24*, 2/26

week 8. 3/3*, 3/5

week 9. 3/17*, 3/19

week 10. 3/24*, 3/26

week 11. 3/31*, 4/2

week 12. 4/7*, 4/9

week 13. 4/14*, 4/16

week 14. 4/21, 4/23

week 15. 4/28

No classes: **3/10, 3/12** (Spring break)

No office hours: **1/27, 1/29, 4/14, 4/16, 4/28**

Last class: **4/28** or **4/23**

Add/drop information: <http://www.virginia.edu/registrar/reginsthowspring2015.html>

Quizzes (approximately):

1/20, 1/29, 2/12, 2/26, 3/19, 4/2, 4/21

Homeworks due (approximately):

1/22, 2/3, 2/10, 2/17, 2/24, 3/3, 3/17, 3/24, 3/31, 4/7, 4/14,