

Stat 7540: Stochastic Processes

Course Syllabus, Spring 2019

Instructor: David Sivakoff

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Office: Cockins Hall 204A

Office hours: M 11:15am–12:15pm, W 1-2pm and 4-5pm, and by appointment (at least 48 hours in advance).

Course time and location: MWF 10:20–11:15am in Cockins Hall 228.

Course webpage: On Carmen: carmen.osu.edu

References:

- *A First Course in Stochastic Processes*, Second Edition, by Karlin & Taylor, Academic Press, 1975.
- *Probability: Theory and Examples*, 5th Edition, by Durrett. Available online: <https://services.math.duke.edu/~rtd/PTE/pte.html>
- *Markov Chains* by Norris, Cambridge University Press.

Content

STAT 7540 is an advanced probability course, building on the material introduced in STAT 7201. Students will learn about advanced probability models, which are used to describe various types of dependence between random variables. Specific topics include:

- Martingales: Convergence, optional stopping theorem, concentration inequalities
- Markov chains: Discrete state Markov chains in discrete and continuous time, Recurrence and transience, stationary measures, ergodicity, strong Markov property
- Brownian motion: Definition, construction and properties

We will cover other topics (e.g., Gaussian processes, renewal processes) as time permits.

Learning Objectives

- Students will be familiar with models of dependence, the questions that can be asked about their properties, and several important tools for answering these questions.
- Students will deepen their understanding of measure theoretic probability through its application to models of dependence between random variables.
- Students will be able to organize and write rigorous mathematical proofs.
- Students will hone their ability to read and comprehend mathematical definitions and arguments, and to relate novel concepts to those learned previously.

Homework and Quizzes (30%)

Homework assignments will be posted on the course webpage in alternate weeks, and will **not** be collected. Instead, there will be a quiz approximately every two weeks, which will be *based on* the previous homework assignments. Quizzes are closed book and closed notes. Quiz dates are as follows:

January 18; February 1 and 15; March 8 and 29; April 12

Midterm and Final Exams (30% midterm, 40% final exam)

There will be one midterm exam and one final exam. Both exams are in-class and closed book. The midterm exam will be on **Friday, March 1**. The final exam will be comprehensive and is on **Thursday, April 25** at 10am to 11:45am.

Missed Work

Please notify me as soon as possible if you will miss any deadlines or exams due to illness or family emergency. Also, if you know in advance that you will miss a quiz or exam due to religious observances or a varsity sport, you must let me know as soon as possible, and at least one week before the exam. Attendance in class is required, and you are responsible for making up for the material covered in class during any absence.

Academic Misconduct

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

You are encouraged to discuss the homework assignments with your classmates and both offer and receive advice. However, the final submission *must be your own work*. For the in-class midterm exam and final exam, you must work completely independently.

Disability Services

Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located in 150 Pomerene Hall, 1760 Neil Avenue; telephone 292-3307, TDD 292-0901; <http://www.ods.ohio-state.edu/>.

Miscellany

- Learning this material, like anything else, takes time. Allow yourself this time by trying to do a little bit of reading and a little bit of *problem-solving* each day, rather than waiting until a deadline is near.
- It is important that you really spend time thinking about how to solve the problems; either those assigned for homework, or others that you find in the textbook. Looking up a solution before you have really struggled to find one on your own denies yourself an opportunity for intellectual growth. It is a good idea to look at the problems *before* reviewing your notes or the textbook. This way, as you read, you can ask yourself, “Is this something I can use to solve one of the problems?”
- Check your email and the course website frequently. I will use the website to post homework assignments, information about the exams, rescheduled office hours, etc.
- Please feel free to approach me with any questions or concerns - my primary goal is to help you learn the material. I hope you enjoy the class!