MATH 562: PROBABILITY THEORY II - FALL 2021

Instructor. Partha Dey, psdey(at)illinois.edu

Times and Places. TR 9:30–10:50 am at 207 Psychology Building.

Course Website. go.illinois.edu/math562. Course info also available at the Compass2g site.

Discussion board. https://campuswire.com/p/G3A439550 with code 8469. I am happy to answer questions on Campuswire.

Contact. By email from your @illinois email, psdey(at)illinois.edu, with "Math 562" in the subject.

Office. 341A Illini Hall.

Office Hours. Tuesday 11–11:50 am and by appointment. Ask questions immediately before, during and after class. Otherwise schedule a time with me by email.

Textbook. Lecture notes and homework problems will be posted on the course website and they are the main texts of the course. We will mainly follow the textbook

- Brownian motion, martingales, and stochastic calculus, Springer (2016) by J. F. Le Gall.

Other references:

- D. Revuz and M. Yor: Continuous martingales and Brownian motion, Springer, 1999;
- I. Karatzas and S. E. Shreve: Brownian motion and stochastic calculus, Springer, 1991;
- S. E. Shreve: Stochastic calculus for finance I and II, Springer, 2004.

Prerequisite.

- Math 561 Probability Theory I - is a prerequisite for this course. However, if you have not taken Math 561, but are willing to invest some extra time to pick up the necessary materials from 561, you may register for this course. Check the course website for 561 lecture notes.
- Math 540 Real Analysis I - we will review measure theory topics as needed.
- Math 541 is also nice to have but not necessary.

Course Syllabus. This is the second half of the basic graduate course in probability theory. The goal of this course is to understand the basic theory of stochastic calculus. We will cover the following topics:

- Brownian motion;
- Continuous Time Matingales;
- Markov processes;
- Stochastic Integrals;
- Ito's formula;
- Representation of Martingales;
- Girsanov theorem and
- Stochastic Differential Equations.

If time allows, we will give a brief introduction to mathematical finance.

Grading. 10% of your grade will be based on detailed Lecture scribes (2 days), 50% will depend on biweekly homework assignments, and 40% will depend on a take home final exam.

You are encouraged to work together on the homework and discuss them on Campuswire, but I ask that you write up your own solutions and turn them in separately. Few problems will be assigned; emphasis will be placed on clear, concise, and coherent writing.

Date: August 23, 2021.