Stochastic Processes

MATH 275C

Instructor: P.-F. Rodriguez
Time: MWF 1-2 PM
Place: MS 5148

Course description: In 1827, British botanist Robert Brown, at the time director of the British botanical museum, observed "pollen grains suspended in water performing a continuous swarming motion" through his microscope. His observation was later applied by Bachelier around 1900 as a of model financial markets, and popularized among physicists, notably by Einstein around 1905, until it was put on firm mathematical grounds by Wiener in 1923, about a century later, to become what is nowadays referred to as Brownian motion.

The course will aim to provide an introduction to some of the most common stochastic processes, focusing mostly (solely) on dynamics which are memoryless, or Markovian. We will first consider discrete state spaces (so called Markov chains) in discrete and continuous time, and then move on to discuss processes on general state spaces, with particular emphasis on Brownian motion and its fundamental properties.

Resources: the first in the following list will be the main reference for this class.

- T. M. Liggett, *Continuous-time Markov Processes - An Introduction.* Graduate Studies in Mathematics, Vol. 113, AMS, 2010.
- R. Durrett, *Probability, Theory and Examples.* Cambridge Univ. Press, 2010.
- J.-F. Le Gall. *Brownian Motion, Martingales, and Stochastic Calculus.* Graduate Texts in Mathematics, Vol. 274, Springer, 2016.

Prerequisites: MATH 275 A and B, or equivalent.

Grading: Grades will be based on homework and a final exam. No late homework will be accepted. Office hours will be held W 2-4 and F 2-3 in MS 6172.