STT 886 (Fall 2019) : Syllabus
Stochastic processes and applications

Léo Neufcourt

neufcour@msu.edu

August 23, 2019

Contents. This course covers the fundamentals of the theory of stochastic processes without assuming knowledge of measure-theoretic probability. After a brief review of probability fundamentals we will study Markov chains – the core topic – as well as classical families of point processes and the Brownian motion. This will be illustrated with examples from finance, population dynamics, etc. The course is intended for master's students and advanced undergraduates. STT 441 (calculus-based introduction to probability) is a prerequisite.

Program.

- – Review of probability theory
- – Conditioning
- – Markov chains
- – Poisson process
- – Markov chains in continuous time
- – Renewal theory
- – Queuing theory
- – Brownian motion
- – Simulations

Class and office hours. Classes will be on Mondays, Wednesdays & Fridays, 12:40-1:30pm, A403 Wells Hall. Regular office hours will be on Mondays & Fridays, 1:30-3:00pm, C442 Wells Hall. Additional times can be arranged by email appointment.

Course materials. The textbook for this course is:

Sheldon M. Ross, *Introduction to Probability Models, 10th Edition*, Elsevier (2010)

Exam and grade. The grade will take into account midterm and final exams as well as regular short homework, and may be adjusted according to attendance and participation. Homework may also evaluated though oral questions in class. The final exam is scheduled on Tuesday, Dec 10 2019 12:45pm - 2:45pm in A303 Wells Hall. On exam days only pens, MSU IDs, and medical prescriptions with official documentation are allowed in the room.

Grade computation.

- E: exam grade (100 points)

- H: homework grade (100 points)

- G: total grade (100 points)

$$G = \max\left(\max(E, H)1_{E \geq 99}, \frac{E + H}{2}\right)$$

Simulation assignments. There will be occasional and simple simulations exercises in Python. They will require the submission of Python files; please use provided templates and follow all guidelines, as submissions will be automatically evaluated. No prior knowledge of Python is required, but you should be(come) familiar with Python basics (https://wiki.python.org/moin/BeginnersGuide).