AMS 263: Stochastic Process
(Winter 2017)
Course Description

January 12, 2017

Lectures: Tuesday, Thursday 5:20-6:55pm (Social Sciences 2, Room 171)
Office hours: Thursday 3-4pm (or by appointment)
Course description and background: This course provides a graduate level introduction to stochastic processes, including Markov processes, hidden Markov models, and point processes. Emphasis will be placed on theory and methods that provide useful background for stochastic modeling and statistical inference in stochastic processes. Although the development of the theory will be careful (especially for Markov chains), this course does not involve a rigorous measure-theoretic treatment of stochastic processes. Knowledge of probability theory, distribution theory, and likelihood inference will be assumed. This background should be at least at the upper division undergraduate level (e.g., courses AMS 131/132), but preferably, at the graduate level (e.g., course AMS 205B). Useful, but not strictly required, background includes measure-theoretic probability (e.g., AMS 261) and Bayesian modeling and inference (e.g., AMS 206B/207).
Course grade: The course grade will be based on two quizzes, one midterm, some selected homework problems and a final project. Most of the homework problems will be on theory and methods from topics covered in class, but there will also be some problems on modeling and inference for data assumed to arise from particular classes of stochastic processes. The project will consist of expository review of a specific part of the relevant literature. The project topic can be on the theoretical side, expanding on the material covered in class. It may alternatively involve statistical modeling and inference methods for a class of stochastic processes, including illustration with appro- priate data sets/case studies. The project topics will be chosen in collaboration with the instructor. A written project report will be required; moreover, there will be in-class project presentations.
Grade distribution: Quizzes 10% each, midterm 30%, selected homework problems 10%,

final project 40%.

Reading/References: The lectures will be based on material taken from textbooks, research reference books, and journal papers. References on specific topics will be provided as needed. There is no required textbook. Relevant book references include:

1. Grimmett, G., and Stirzaker, D. (2001). Probability and Random Processes (Third Edition). Oxford University Press.

2. Insua, D.R., Ruggeri, F., and Wiper, M.P. (2012). Bayesian Analysis of Stochastic Process Models. Wiley.

3. Karlin, S. and Taylor, H.M. (1974). A First Course in Stochastic Processes. Academic Press, INC.

4. Ross, S.M. (1996). Stochastic Processes (Second Edition). Wiley.

5. Guttorp, P. (1995). Stochastic Modelling of Scientific Data. Chapman and Hall/CRC.

6. Zucchini, W., and MacDonald, I.L. (2009). Hidden Markov Models for Time Series: An Introduction Using R. Chapman and Hall/CRC.