

## STAT 521, Applied Stochastic Processes -- Spring 2017

### **Instructor:**

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Course Web Page: <http://www.stat.sc.edu/~hitchcock/stat521.html>

(Also accessible via Blackboard – go to course page in Blackboard

And then click on “Course Web Page” link on left of page)

### **Classes:**

Meeting Times: MWF, 1:10 pm - 2:00 pm, Close-Hipp Building 351

### **Office Hours:**

Mon 2:15-3:15 pm, Tues 2:00-3:00 pm, Wed 2:15-3:15 pm, Thurs 1:45-2:45 pm, or by appointment or **please feel free** to make an appointment to see me at other times.

### **Textbook:**

*Introduction to Probability Models*, by Sheldon M. Ross, Academic Press, 2014.

**Prerequisite:** STAT 511/MATH 511 with a grade of C or higher.

**Course Outline:** Chapters 1-6 and 10 of the Ross textbook. Topics covered include: Review of Basic Probability: Events and random variables, permutations, combinations, simulation, conditional probability, independence, common distributions and their properties. Discrete Markov chain theory: Chapman-Kolmogorov's equations, classification of states, equilibrium and its applications, branching processes, MCMC methods. Exponential distribution and Poisson processes: memoryless property, counting processes, interarrival times, applications to insurance. Continuous Markov models: Birth and Death processes, queueing models, limiting probabilities, transition functions. Rudiments of Brownian motion, stochastic integration, Gaussian time series analysis.

**Learning Outcomes:** By the end of the term successful students should be able to do the following:

- Demonstrate a working knowledge of the basic definitions of discrete and continuous Markov chains, the Poisson process, Brownian motion and its preliminary stochastic calculus.
- Be able to effectively utilize the computer package R to perform the basic calculations required to apply the methods covered in the course, and to demonstrate the methods using simulation.
- Be able to apply the methods covered in the course to a large variety of problems one may encounter on actuarial exams.
- Appreciate how probability theory can be applied to the study of phenomena in fields as diverse as engineering, computer science, management science, the physical and social sciences, and operational research.

### **Exams:**

There will be two in-class exams (Feb. 17 and March 24) and a final exam on April 28. Exams may not normally be made up, except in extreme circumstances, for which written documentation of excuse (doctor's note, funeral notice, etc.) is required. If you suspect you may miss an exam day, it is important to contact me well in advance of the test date.

**Homework:** Homework will be assigned on the course web page. Due dates will be posted given on the course web page. Late homework will be penalized. You must do each homework problem independently. You may not look at another student's work while doing the homework. You may ask me for help on the homework problems. If homework is found to have been copied, all students involved will receive a 0. [To be clearer, students can ask each other informal ORAL questions about homework, but **cannot look at or copy each other's homework papers**. All submitted homework must be the student's **own work** and **NOT come from any other person or external source.**]

**Graduate Students:** Any students enrolling in the course for graduate credit will do some extra homework problems during the semester. These problems may be extra credit for undergraduate students.

**Grading:** The course grade will be based on homework average (15%), the two midterm exams (27.5% each), and a final exam (30%). The overall course average will result in the following grades: 90-100 = A, 87-89 = B+, 80-86 = B, 77-79 = C+, 70-76 = C, 67-69 = D+, 60-66 = D, 59 and below = F.

**Computing:** Some problems in this course involve computations, and for these, we will learn to use the free software package R. This is available in the labs and also as a free download for your home computer (see course web page for details). It is not assumed that you have much/any previous experience with R. Example code in R will be given on the course web page.

**During Class:** No cell phones may be on during class. Laptop computers must be put away during class time. Tablets (e.g., i-pads) may be used *only for note-taking*, only if flat on the desk like a traditional notebook. Students may not use tablets to look at web pages, play games, etc.

**Course Schedule:** MWF, Jan 9, 2015 - Apr 24, 2015, and note:  
No class (MLK Day): January 16 (Monday)  
Last day to withdraw without "WF" grade: March 2 (Thursday)  
No class (Spring Break): March 6-10 (Monday- Friday)

Friday, February 17: Exam 1

Friday, March 24: Exam 2

Friday, April 28 (12:30 p.m.): final exam