STAT 520 (=MGSC 520), Forecasting and Time Series -- Fall 2025

Instructor:
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Course Web Page: http://people.stat.sc.edu/hitchcock/stat520.html
                (Also accessible via Blackboard – go to course page in Blackboard
                And then click on "Course Web Page" link on left of page)

Class Meeting Times: MWF 10:50 am - 11:40 a.m., LeConte 103

Office Hours: Monday, Wednesday, Friday 9:40-10:30 a.m. and Tuesday 10:30-11:20 a.m., or **please feel free** to make an appointment to see me at other times.

Textbook: Main textbook: *Time Series Analysis with Applications in R* (2nd Edition), by J.D. Cryer and K. Chan, Springer, 2008.
Optional textbook: *Time Series: A Data Analysis Approach*, by R.H. Shumway and D.S. Stoffer, 2019.
The Shumway and Stoffer textbook is available at
https://www.stat.pitt.edu/stoffer/tsda/
That site also has all the R code used in the Shumway and Stoffer book.

Prerequisite: STAT 516 or MGSC 391, or equivalent, or permission of department

Course Outline: Chapters 1-10 of the Cryer and Chan textbook. Topics covered include: models for stationary and nonstationary time series, analysis of trends using regression methods, ARIMA model specification, transformations, parameter estimation, model diagnostics, forecasting, and seasonal ARIMA models, and (time permitting) relationships between time series, interventions and outliers (Chapter 11), and ARCH and GARCH models (Chapter 12).

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

• Understand how fundamental measures such as mean, variance, and autocovariance and autocorrelation relate to time series data
• Understand the common models used in time series analysis
• Specify and estimate appropriate models for real time series data
• Undertake model validation and remedial action to improve models
• Perform advanced time series data analyses such as forecasting and inference

Exams:
There will be two midterm exams (an in-class exam scheduled for September 24, and a take-home exam around early to mid-November). There will be an in-class final exam on Friday, December 12 at 9:00 a.m. The first midterm exam will be given in the classroom during the regularly scheduled class time.

Class Lectures / Attendance Requirement:
You are urged to attend the lectures live on Mondays, Wednesdays, and Fridays in LeConte 103. If you are forced to miss a class or if you would like to review material from a class, I plan to ATTEMPT TO record the lectures on Zoom and post them in Panopto in the Blackboard STAT 520 course page. This is not a replacement for attendance and some aspects of the class (for example, if I write occasional notes on the board/document camera) may not show up on the recorded version. In addition, I make **no guarantees** that the recordings will always be successful. In short: Please come to class!

Since this is an in-person class, you are expected to attend at least 80% of the class sessions in person. Attendance will be taken each class, and your grade on the attendance component will be 1.25 times the percentage of class sessions that you attend live (with a maximum of 100% for the attendance grade). For example, if you attend 60% of the class sessions in person, your attendance grade (which is 7% of the overall course grade) will be 75%. If you attend 80% or more of the class sessions in person, your attendance grade will be 100%.

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 and will not be accepted once solutions are posted. You may ask each other informal questions about the homework, but everyone is to do his/her own work. If homework is found to be copied, all students involved will receive a 0. Of course, you may always ask me questions about the homework. [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 their own work.] Note that for the take-home midterm, you MAY NOT talk to each other about the problems at all.

GenAI Use: Please see https://people.stat.sc.edu/hitchcock/GenAIPolicyHitchcock.pdf for the policy restricting GenAI use in this course.

Project: All students must do a data-analysis project. The project will contain the analysis of a real time series data set of interest using methods we have learned in this class, and a typed report detailing the findings of the analyses. The details about the project will be announced early in the course, and parts of the project will be due at different times over the semester.

Graduate Students: The university requires that 500-level classes be more rigorous for graduate students than for undergraduates. Homeworks will occasionally involve extra problems that will be required only for graduate students. These will be graded separately for graduate students, and a grade of 70% or higher must be earned on the combined extra sections across the problem sets or a letter grade (A→ B, B+→ C+, etc…) penalty will be applied to the final course grade.

Grading: The course grade will be based on attendance (7%), homework average (11%), project grade (14%), the two midterm exams (22% each), and a final exam (24%). 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 significant 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 is given on the course web page.

During Class: No cell phones may be on during class. In the classroom, laptops and tablets (e.g., iPads) may be used only for note-taking and other course-related activities. Students may not use laptops and tablets to look at unrelated web pages, play games, etc.

Disabilities: Any student with a documented disability should contact the Student Disability Resource Center at 777-6142 to make arrangements for appropriate accommodations.

Exam Schedule:
September 24: Exam 1
Early- to mid-November: Exam 2
Friday, December 12, 9:00 a.m.: Final Exam