

# MATH 369/669: Time Series and Forecasting, Fall 2016

Professor: Dr. Rob Erhardt

Office: 342 Manchester Hall

Office Hours: Tuesdays 4-5:30 PM, Wednesday 3:15 - 4PM, and by appointment

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1. **Location and Time:** 11:00-11:50 MWF, Manchester 125
2. **Book:** *Introductory Time Series with R* (2009) by Cowpertwait and Metcalf, Springer.
3. **Prerequisites:** MTH 111 (some experience with calculus) and MTH 256/656 Statistical Models, or POI. Previous experience with statistical models (residuals, hypothesis testing and p-values, model selection criteria) of some sort is essential. For calculus, students should have some comfort with functions of one variable including integration, and summations. No previous computer programming experience is needed.
4. **Outline:** This course covers the statistical analysis of time series data, often obtained by repeatedly measuring a quantity at distinct time points. Examples include daily stock prices and financial data, weather and climate data, quarterly business earnings, monthly electricity usage, and so on. What separates these datasets from those you may have encountered in other statistics courses is that the measurements are *autocorrelated*, meaning the measurement from time  $t$  bears some relationship to the measurements taken at times  $t - 1$  and  $t + 1$ . Recognizing this relationship allows us to build more accurate models, and therefore make more accurate predictions.

In particular, we will cover exploring data (chapter 1), measures of correlation (chapter 2), basic and stationary models (chapters 4 and 6), and selected topics as time permits. Throughout the course, we will be concerned with *forecasting* future values with an understanding of our *forecast error*. The ability to accurately quantify forecasting error is one of the central values of statistical models. We will also develop strong programming skills needed to manage and analyze modern datasets.

## 5. What is Assigned:

- **Assignments:** (18%) We will have weekly homework assignments, generally due on Wednesdays. You may discuss problems with classmates, and indeed you are encouraged to do so, but everything you write must be your own work. In particular, you must entirely code your computer programs to analyze data. If you need to miss class, you may place your assignment in my mailbox at Manchester 131 anytime before class. Unless you have advance permission, homework up to 24 hours late is counted at 50%, and not accepted after 24 hours.
- **Exams:** (25% each) There will be two in-class exams, on **Friday October 14** and **Friday November 18**. Specific topics and details on the exams will be announced in advance of each exam. Exams are closed-book and closed-notes, but you may use any simple calculator (square root,  $e^x$ ,  $\log(x)$ ). You may not use any device with WiFi access as your calculator.

- **Final Exam:** (32%) Our comprehensive final exam will be held on **Saturday December 17 at 2PM**. Topics will be announced in advance.

6. **Software:** We will use **R**, a free statistical software program which can be found here: (<http://cran.us.r-project.org/>). In particular, we will use RStudio as a convenient framework for programming. Students must write their own computer programs from scratch, but no previous computer programming experience is needed.
7. **Grading:** Grades follow the standard scale, with cutoffs: 93 A, 90 A-, 87 B+, 83 B, 80 B-, 77 C+, 73 C, 70 C-, 67 D+, 63 D, 60 D-, and below 60 is F. Modest curving of grades *may* be used, but only at the end of the semester. Graduate students enrolled in MTH 669 will have some additional questions on homework assignments and exams.
8. **Honesty and Courtesy:** Academic dishonesty of any sort will not be tolerated, and could result in an immediate grade of F. Refer to <http://services.studentlife.wfu.edu/judicial-affairs/honor/>. Phones, laptops, and other electronic devices are distractions when used for non-academic work in class. There is a mountain of research that shows we do lower quality work when distracted by electronic devices. Additionally, I find it extremely disheartening when I see students distracted by electronic devices during class. Surely you can last 50 minutes disconnected.
9. **Getting Help:** Come to my office hours, or e-mail me and set up an appointment. Please contact the Learning Assistance Center (758-5929) within the first two weeks of class if you require accommodations for taking this course due to a disability.