## Course Outline for Spring 2013, Statistics 153: Introduction to Time Series

University of California, Berkeley

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- Instructor: Aditya Guntuboyina. Email: aditya@stat.berkeley.edu and Website: www.stat. berkeley.edu/~aditya
- Lectures: 3:30 pm to 5 pm on Tuesdays and Thursdays at 9 Lewis Hall.
- Office Hours: 11 am to 12 pm on Tuesdays and Thursdays at 423 Evans Hall.
- **GSI**:
- GSI Lab Section: 12 pm to 2 pm OR 3 pm to 5 pm on Wednesdays at 330 Evans Hall (The first section will include a short Introduction to R).
- **GSI Office Hours**: TBA.

**Short Description**: A time series is a set of numerical observations, each one being recorded at a specific time. Such data arise everywhere. This course aims to teach you how to analyze time series data. There exist two main approaches to time series analysis: *Time Domain* approach and *Frequency Domain* approach. Approximately, about 60% of the course will be on time domain methods and 40% on frequency domain methods.

**Tentative List of Topics**: *Basic Topics*: Tackling Trend and Seasonality, Stationarity and Stationary ARMA models, ARIMA and Seasonal ARIMA models, Discrete Fourier Transform and the Periodogram, Spectral Density, Spectral Estimation. After these basic topics are covered, if time permits, we might go over one or two advanced topics such as: state space models, wavelet based methods and non-linear time series models.

**Prerequisite**: This course is intended for students who have taken at least one elementary statistics course (e.g., 101) and one elementary probability course (e.g., 134).

**Text**: *Time Series Analysis and its Applications* (Third Edition) by Shumway and Stoffer. I think this is the best book out there for this course. It is available for free via the library website. I will follow it but not too closely.

If you do not like it however, here are other standard books that you might try to read:

- 1. Time Series Analysis with Applications in R by Cryer and Chan. A more elementary text than Shumway and Stoffer. Available for free online.
- 2. Fourier Analysis of Time Series by Bloomfield. This book only covers the frequency domain approach.
- 3. Introduction to Time Series and Forecasting by Brockwell and Davis. This is a very standard introductory time series textbook.

Lecture Notes and R code: I usually prepare typed notes for each lecture. I also show data analysis examples on R in class. I will post both the lecture notes and R code on either my website or on bspace after each lecture.

**Homework assignments**: These will involve a mix of theoretical (pen and paper) and computer exercises. I will post them on the class bSpace page or on my website (roughly once every two weeks) on a Thursday and will be due at the **beginning** of the Friday section the week after. Late assignments will not be accepted.

**Exams**: There will be three exams in all: two midterms and one Final. Midterm 1 is on February 28 and Midterm 2 on April 04 (they will be held in the classroom during the regular lecture hours). The Final is on May 17.

Assessment: Your final grade will be a weighted average of our homework (30%), Midterm (35% = 20% of the midterm you do well in + 15 % of the other midterm) and the final (35%).

**Grade Complaints**: If you have a complaint against an assigned homework or exam grade and want to talk to me about it, first send me a written request through email explaining your case clearly.

Academic Integrity: You are encouraged to work in small groups on homework problems. However, you must write up the solutions on your own, and you must never read or copy the solutions of other students. Similarly, you may use books or online resources to help solve homework problems, but you must credit all such sources in your writeup and you must never copy material verbatim. Any student found to be cheating risks automatically failing the class and being referred to the Office of Student Conduct. In particular, copying solutions, in whole or in part, from other students in the class or any other source without acknowledgment constitutes cheating.

**Students with disabilities**: If you need accommodations for any physical, psychological, or learning disability, please get in touch with me so that we can make the necessary arrangements.