STAT 673 Spring 2010
Time Series Analysis Professor Bailey

Syllabus

Course Web Page: `http://rohan.sdsu.edu/~babailey/stat673`
and `blackboard.sdsu.edu`

Meeting Time: Lectures: MW 4:00 - 5:15 p.m. in GMCS 325

Instructor: Professor Barbara Bailey
GMCS 513
email: babailey@sciences.sdsu.edu
Office Hours: M 2:00 - 3:00 p.m., W 3:00 - 4:00 p.m; by appointment

Reference: The textbook for the course is

Wei, W. W. S. (2006). *Time Series Analysis Univariate and Multivariate Methods*, 2nd Edition. Addison Wesley.

Objectives: Time series data occur when a single experimental unit or process is observed repeatedly over time. Data of this type are common in many different fields including economics, industrial process control, environmental monitoring, epidemiology, and experimental biology. Statistical methods that assume independence are inappropriate for time series data. This course will provide you with the basic theory and tools for the statistical analysis and interpretation of time series. Broadly the methods may be categorized into time-domain and frequency-domain methods. Time-domain methods develop explicit models for the evolution of a process over time. Frequency-domain methods equivalently model the correlation structure of the time series. Other topics include methods for model-based estimation, model selection, diagnostics, forecasting, and computing as they relate to time series analysis.

Homework: Homework assignments will be regularly available on the course web page as announced in class. The homework will contain a series of practice problems of which *selected problems* **will** be graded. The homework serves as a tool to review and practice the material covered in class. All material covered on the assignments can be questioned on the exams. Some problems may require computing and must include concise computer output with a clearly presented version of your code.

Late homework will not be accepted. You may drop your lowest percentage score.

Exams: There will be one in-class midterm Wednesday March 17, with a take-home portion due approximately the same week. The in-class part of the exam will be closed book. A hand calculator is necessary for all exams. *No collaboration of any kind is allowed on the take-home part of the exam.*

No makeup exams are given - no exceptions.

The final exam will be given Wednesday, May 19 from 3:30 p.m. to 5:30 p.m. in GMCS 325. The final will be cumulative and comprehensive.

Project: As part of the course you will be asked to do an individual project. The project grade will be based in part on a brief 3-5 page written report in journal style format (i.e., 12 *pt* font, one inch margins, single-spaced, figures and tables clearly presented and labeled, page limit does not include figures, tables, nor bibliography) and a brief 5-10 minute presentation (depending on the size of the class) during the last full week of classes. You are required to attend *all* project presentations. Attendance at the presentations will be a part of your project grade.

The project will be done individually. You will illustrate and present the importance of time series analysis concepts in the literature. In consultation with me, you may may choose a journal article of interest to you. As part of the project, expect to read the journal article, write a report, and give an oral presentation to demonstrate a thorough understanding of and to illustrate the techniques/methods used in the article.

Grading: The grade for the class is based on a score composed of the following.

Homework	30 %
Midterm Exam	30 %
Project	10 %
Final Exam	30 %

Teaching Furlough Day: There will be no class on Wednesday May 12.

Topics to be covered: basic outline; topics may be added and/or dropped as the semester proceeds.

1. Fundamental Concepts of Stochastic Processes
   a. Autocovariance and Autocorrelation Functions
   b. Moving Average and Autoregressive Representations
2. Stationary and Nonstationary Time Series Models
   a. Autoregressive Processes
   b. Moving Average Processes
   c. ARMA Processes
   d. ARIMA Processes
   e. Seasonal ARIMA Models
3. Forecasting
4. Fitting Models to Data
   a. Model identification
   b. Parameter estimation
   c. Model diagnostics and model selection
5. Spectral Theory
   a. Fourier Representations
   b. Spectrum
   c. Periodogram
6. State Space Models
   a. Kalman Filter

Prerequisites: A calculus-based probability course (STAT 551B or 670B).

Tardiness and Early exits: The class time is from 4:00 - 5:15 p.m. As common courtesy to your fellow students, we would appreciate if you show up to class on time and leave when dismissed at 5:15. If you must leave early, please inform me and sit on the aisle near an exit so as not to disturb students listening to and trying to learn from the lectures.

Code of Academic Conduct on Examinations and Assignments: "At San Diego State University, students are invited to be active members of the educational community. As with any community, its members serve a vital role in determining acceptable standards of conduct, which includes academic conduct that reflects the highest level of honesty and integrity." The "Statement of Student Rights and Responsibilities clarifies for students their role as members of the campus community, setting forth

what is expected of them in terms of behavior and contributions to the success of our university." "Inappropriate conduct by Students ... is subject to discipline on all San Diego State University Campuses. The Center for Student Rights and Responsibilities coordinates the discipline process and establishes standards and procedures in accordance with regulations contained in Sections 41301-41304 of Title 5 of The California Code of Regulations, and procedures contained in Executive Order 628, Student Disciplinary Procedures for The California State University." See http://www.sa.sdsu.edu/srr/judicial for more information.

Other information: See course web page: http://rohan.sdsu.edu/~babailey/stat673