MET AT743 Regression & Time Series SYLLABUS Spring 2012

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Teaching Fellow: Yuan Li, e-mail: emilyli@bu.edu

Office Hours: Thursdays: 3:00-5:00pm.

Class Meetings: 6:00pm - 9:00pm, Wednesdays, MCS B23

Text: Brockwell P. J. and Davis R. A. "*Introduction to Time Series and Forecasting*", 2th ed., Springer-Verlag, 2002, ISBN: 0-387-95351-5.

Class Website: Handouts and other course information will be made available on the **Blackboard** or on the course website: http://math.bu.edu/people/ginovyan/ma743.html

Course Objectives: This course explores the fundamental principles and methods of Regression and Time Series. It will cover two-variable and multiple regression models, properties of time series, estimating and forecasting with time series models. It is a fundamental course for those who want to gain knowledge in theoretical as well as applied regression and time series analysis.

Classes: Class attendance and participation are vital. Arriving on time, and being prepared for the new material, are absolutely necessary to get the most out of this course. You should read the materials in the book that a lecture covers before attending the lecture. Lectures have the highest priority for exam content and proper manner of presentation of solutions. Each class will consist of a lecture, going over related examples and answering of any student questions.

Prerequisites: MA582.

Homework: Homework will be assigned regularly during the course and a due date will be announced. **No late homework will be accepted.** Solving the problems assigned for homework is fundamental to succeed in this class. Most of your learning takes place while solving problems. To receive full credit for your solutions of the homework problems, all work must be shown. Besides, exams will be based on homework assignments. ***The lowest score will be dropped if you have perfect attendance and submitted all the homework.***

Project: There will be one semester-long project. The projects will focus on topics pertinent to the course content but not actually covered in the class. The topics and details of the project will be specified later.

Exams: There will be **two** in-class one hour midterms and one two hour final (comprehensive).
All exams are required. Exams will take place according to the following schedule:

Midterm I:	Wednesday,	February	29	
Midterm II:	Wednesday,	April	11	
Final:	Wednesday,	May	9	(6:00 - 8:00pm, MCS B23)

Grading Policy: **Project:** 10%, **Homework:** 15%, **Midterm I:** 22.5%, **Midterm II:** 22.5%, **Final:** 30%.

Final Grade Distribution: **A-Scale: 90 – 100; B-Scale: 76 – 89; C-Scale: 65 -75.**

Examination Policy: All exams are closed book and notes. All work must be shown to receive credit and answers should be given exactly.

Make-up Policy: Exams **cannot be made up** unless for a truly exceptional and documented reason.

Incompletes and Withdrawals: The incomplete grade "I" is given only in exceptional cases to students who have maintained a ***good record*** through much of the course and suddenly find themselves in difficult circumstances (illness, death in the family). Others who find early on that they are not keeping up are urged to drop or withdraw from the course. Please be aware of the last date to process a withdrawal.

Important dates: The last day to drop the class **without a 'W'** grade on your transcript is **Tuesday, February 21**, and the last day to drop the class **with a 'W'** grade is **Friday, March 30.**

Extra help: You are encouraged to take advantage of the office hours of the teaching fellow and myself, and feel free to make appointments outside of the scheduled times. Whenever you need help, please don't hesitate to let me know.

Note: BU has a strict policy against cheating and plagiarism. Any form of cheating or plagiarism will not be tolerated.

Tentative Outline of Topics:

1. Overview of the course.
2. Review of some basic probability concepts. Measuring the dependence between two random variables. The covariance, correlation, and independence.
3. Review of some basic statistics concepts. Sampling distributions. Point and interval estimation. Hypothesis testing.
4. The Prediction Problem. Conditional probabilities and expectations. Probabilistic solutions of MSE and mean absolute value prediction problems. The MSE-linear prediction problem.
5. The Basics of regression analysis. The method of least squares. The linear regression model. Statistical solution of prediction problem. Residuals. Some nonlinear regression models: exponential, logarithmic and logistic regression models.
6. Statistical inferences for two-variable regression models. Properties and distributions of regression unknown parameters. Best linear unbiased estimators (BLUE). Gauss-Markov theorem. Confidence intervals and hypothesis testing about regression unknown parameters. Analysis of variance and correlation. Goodness of Fit. The coefficient of determination. Inferences about the regression line. Prediction intervals for future values.
7. Multiple regression models. Elements of matrix algebra. Statistical inferences. Model utility and the multiple coefficient of determination. Full (complete) and reduced models.
8. Inherently linear models: polynomial and interaction models. Regression models involving dummy variables. Mixed continuous-dummy models. Multicollinearity. Partial correlation. Piecewise linear regression.
9. Smoothing and extrapolation of time series. Properties of stochastic time series (Ch.1).
10. Stationary processes. Linear time series models, forecasting (prediction) with time series models (Ch. 2).
11. ARMA models (Ch. 3)
12. Spectral analysis of time series models (Ch. 4).
13. Modeling, estimating and forecasting (prediction) with ARMA time series models (Ch. 5).
14. Nonstationary and seasonal time series models (Ch. 6).