Math 564 – Applied Statistics

Course Description from Bulletin: Simple linear regression; multiple linear regression; least squares estimates of parameters; hypothesis testing and confidence intervals in linear regression models; testing of models, data analysis and appropriateness of models; linear time series models; moving average, autoregressive and/or ARIMA models; estimation, data analysis and forecasting with time series models; forecasting errors and confidence intervals. Credit may not be granted for both MATH 484 and MATH 564. (3-0-3)

Enrollment: Elective for graduate students in applied mathematics and other disciplines


Other required material: R or JMP 9 software

Prerequisites: MATH 474 Probability and Statistics, or MATH 476 Statistics, or MATH 563 Statistics, or consent of the instructor

Objective
1. Students will learn about the regression and forecasting models and their applications in various fields of science and engineering.
2. Students will be able to formulate real life problems using regression and forecasting models.
3. Students will be able to use statistical software to estimate the models from real data, and draw conclusions and develop solutions from the estimated models.
4. Students will learn to use visual and numerical diagnostics to assess the soundness of their models.
5. Students will learn to communicate the statistical analyses of substantial data sets through explanatory text, tables and graphs.
6. Students will learn to combine and adapt different statistical models to analyze larger and more complex data.

Lecture schedule: Three 50 minute (or two 75 minute) lectures per week

Course Outline:         Hours
Part I: Regression
1. Simple Linear Regression, 4
2. Multiple linear regression and least square estimations, 6
3. Inference, Diagnostics, Transformations, 6
4. Variable selection, testing and appropriateness of models 2
5. Qualitative predictors, 1
6. Logistic regression, 3
7. Nonlinear regression. 2

Part II: Forecasting
1. Linear time series regression, 3
2. Moving average models, 2
3. ARIMA models, 5
4. Estimation of models, forecasting errors and inference, 2
5. Transfer function models. 2

Assessment:

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<tr>
<th>Component</th>
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<tbody>
<tr>
<td>Homework</td>
<td>10-30%</td>
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<tr>
<td>Project</td>
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<td>Tests</td>
<td>20-40%</td>
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<td>Final Exam</td>
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Syllabus prepared by: Lulu Kang, Andre Adler, and Fred Hickernell
Date: Feb 6, 2012 (updated Oct.15, 2015 by Lulu Kang)