Course Syllabus
MTH 663: Time Series Forecasting
Spring Semester 2009

Course:
Title : MTH 663 – Time Series Forecasting
Section : 201
CRN : 3410
Classes : TR 6:30 – 7:45P.M
Venue : SH 518 (This may change)

Instructor:
Dr. Alfred Akinsete
Morrow Library – ML105
Phone number 696 3285
Email Address – akinsete@marshall.edu

Office Hours:
TR 11:00 AM – 1:00 PM, and any other time by appointment

Course Description, Objectives, Credits, and Prerequisites:

Description: This course covers topics in time series analysis and some statistical techniques on forecasting. These are time series regression, decomposition methods, exponential smoothing, and the Box-Jenkins forecasting methodology.

Objective: The principle objective of the course is to introduce graduate and advanced undergraduate students in mathematics, economics, business, engineering, meteorology, various areas of social science, and any other field where analysis and research of time series are prevalent to many approaches of analyzing time series data. And at the same time, equip them with adequate statistical tools and knowledge to make precise decisions, based on forecasts obtained from the statistical analysis of historical data.

Student Learning Outcomes: At the end of the course, the student will be able to
- analyze any time series data using various statistical approaches
- generate reasonable forecast values, and
- to make concise decisions based on forecasts obtained

Credit Hours: 3
Prerequisite: MTH 230, or any equivalent course approved by the instructor.

Text Information:
Title : Time Series Analysis with Applications in R, 2ed.
Author : Cryer, J. D., and Chen, K. [CC]
Publisher : Springer, New York, NY.
Year : 2008

Coverage: A course on time series analysis and forecasting may be taught from different perspectives. Here, we focus on univariate time series using the time domain approach. We shall also consider the frequency domain approach
as alternative approach wherever appropriate. The topics to be discussed are as outlined in the Contents section of Cryer and Chen, with possible exception of Chapters 12 and 15. The topics in those chapters are advanced and require more time. The topics to be considered are also found in Bowerman et al. (2005). Ideas would be drawn from Bowerman, from time to time. You are not required to buy this book. Most of these topics are contained in Parts I (Chapter 2 is assumed. Only a brief review is required), III, IV (Excluding Chapter 12, but taught only if there is time). Other useful materials on Spectral Analysis may be found in Chapters 11 – 13 of Wei (2006), with examples and R implementations from Cryer amd Chen (2008). See also Shumway and Stoffer (2006), which has lots of R examples.

**Topic (Tentative)**

<table>
<thead>
<tr>
<th>Topic (Chapters 1 – 3)</th>
<th>Period</th>
<th>Week Ending</th>
<th>Cum. Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>(1 week)</td>
<td>01/15/09</td>
<td>01</td>
</tr>
<tr>
<td>Fundamental Statistical Concepts</td>
<td>(1/2 week)</td>
<td>01/20/09</td>
<td>1.5</td>
</tr>
<tr>
<td>Trend Analysis</td>
<td>(1 ½ weeks)</td>
<td>01/29/09</td>
<td>3.0</td>
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</table>

**Part II (Chapters 4 – 9):**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Period</th>
<th>Week Ending</th>
<th>Cum. Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Models for Stationary Time Series</td>
<td>(1 week)</td>
<td>02/05/09</td>
<td>4.0</td>
</tr>
<tr>
<td>Models for Non-Stationary Time Series</td>
<td>(1 week)</td>
<td>02/12/09</td>
<td>5.0</td>
</tr>
<tr>
<td>Model Specification or Identification</td>
<td>(1 week)</td>
<td>02/19/09</td>
<td>6.0</td>
</tr>
<tr>
<td>Parameter Estimation</td>
<td>(1 week)</td>
<td>02/26/09</td>
<td>7.0</td>
</tr>
<tr>
<td>Model Diagnostics</td>
<td>(1 week)</td>
<td>03/05/09</td>
<td>8.0</td>
</tr>
<tr>
<td>Forecasting</td>
<td>(1 week)</td>
<td>03/12/09</td>
<td>9.0</td>
</tr>
</tbody>
</table>

**Part III (Chapters 10 – 11):**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Period</th>
<th>Week Ending</th>
<th>Cum. Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seasonal Models</td>
<td>(1 ½ weeks)</td>
<td>03/31/09</td>
<td>10.5</td>
</tr>
<tr>
<td>Time Series Regression Models</td>
<td>(2 weeks)</td>
<td>04/14/09</td>
<td>12.5</td>
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</table>

**Part IV (Chapters 13 – 14):**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Period</th>
<th>Week Ending</th>
<th>Cum. Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Spectral Analysis</td>
<td>(1 ½ weeks)</td>
<td>04/23/09</td>
<td>14.0</td>
</tr>
<tr>
<td>Estimating the Spectrum</td>
<td>(1 weeks)</td>
<td>04/30/09</td>
<td>15.0</td>
</tr>
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**FINAL EXAMINATION:**

Tuesday, May 05, 2009 [06:00 – 08:00 PM] 16

**Attendance**

Students are expected to attend all scheduled classes. It is the student’s responsibility to find out what was discussed in a missed class. Although, attendance records will not be used to compute grades (except possibly in borderline cases), however, missing class can be expected to significantly reduce your chances of success. Note also that it is the student’s responsibility to present approved notice of any absence that would be excused under the terms and regulations stipulated by the university.

**Plagiarism**

Note that plagiarism (the submission as one’s own work of any oral, graphic, or written material wholly or in part created by another), is a form of academic dishonesty. Sanctions for academic dishonesty shall be imposed in accordance with university’s guidelines on such matter.

**Homework**

Homework problems will be collected and graded. Make it a habit to do your homework the same day they are assigned. Ensure to submit your homework as at when due. Submission within 24 hours from when it is due will be based on 80% of full credit. No late submission will be accepted after 24 hours from when it is due. You are welcome to collaborate with other students on homework, although you must turn in your own work, and written in your own style and words. Solutions to problems must be made clear and neat. In cases where solutions require detail explanation and derivations, a one-number solution will not be accepted. Homework exercises assigned on a Tuesday (Thursday) shall be due for submission the following Thursday (Tuesday).
Student Behaviors

Students are advised to turn their cell phones and other noise generating devices off prior to entering the class. In the case where a student awaits any emergency call, the noise should be restricted and made personal. And in this case, I should be notified as soon as the student enters the class. Food items, apart from water or soft drink, are not allowed in the class. The reading of newspapers and other unrelated materials while the class is in session is prohibited. Please ensure that other students are respected.

Cheating

Note that in a case where a student is suspected to have cheated, the student may be asked to re-take the test. And where the student is found or confirmed to have cheated, a zero grade will be awarded to the student.

You may wish to refer to other university policies concerning academic dishonesty at, www.marshall.edu/academic-affairs/Academic%20Dishonesty%20Policy.pdf

Other Policies

- Information regarding the university policy for students with disability can be found in http://www.marshall.edu/disable
- Statement regarding University Computing Services Acceptable Use Policy can be located at http://www.marshall.edu/ucs/CS/acptuse.asp
- Statement regarding Marshall's policy about inclement weather can found in the link http://www.marshall.edu/www/policy/policy_07.html
- Statement regarding Marshall’s policy on Affirmative Action can found in the link www.marshall.edu/eeoaa/Forms/EEO-Policy.pdf

Statistical Resources

Books other than the one recommended for this course will be used. The main reason for choosing the recommended textbook is the implementation of the R program as additional resource for the book. It is important that every student should visit http://www.r-project.org/ or http://en.wikipedia.org/wiki/R and download the R programming language/software from your preferred CRAN mirror. It will be needed in the course of our discussion. Note that your knowledge of the programming language is not the focus in this course. A basic R source manual needed for statistical computing is provided on the WebCT. Howbeit, students are allowed to use any other statistical software other than the R program. These include SAS, JMP, TSP, MATLAB, SPSS, and any appropriate other software.

Examination

The final grade will be based on the following components:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Tests</td>
<td>300</td>
</tr>
<tr>
<td>Homework Exercises</td>
<td>100</td>
</tr>
<tr>
<td>Project*</td>
<td>100</td>
</tr>
<tr>
<td>Final Examination</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>600</strong></td>
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* A final project shall consist of the analysis of a time series data collected by you. You would be required to implement any, or multiple of the forecast methodologies discussed in class. You are not required to submit a theoretical study of time series analysis. If you need any help in the collection of data, I would be glad to assist.
The semester grade will be based on the percentage of the 500 total possible points, using the following scale.

- 90 -100% -- A
- 80 - 89% -- B
- 70 - 79% -- C
- 60 - 69% -- D
- 0 - 59% -- F

Additional Resource Materials

The following are other resource materials. Let me know if you are interested in any of them, and I would be glad to let you have it for a period of time.