GRADUATE PERMISSION TO CROSS-LIST FORM

This form must ALWAYS be accompanied by a graduate COURSE FORM.

Contact Name: Martin Jones Email: jonesm@cofc.edu Phone: 953-5735

Department and School Name: Mathematics, School of Science and Mathematics
Name and Acronym of Graduate Program: Master of Science in Mathematics MATH

Date (Semester/Year) cross-listing will take effect: Fall 2015

I. CATEGORY OF REVIEW (Check all that apply)

X New Course -- Course Number/Title Math 661 Time Series
☐ Existing Course -- Course Number/Title
☐ Special Topic Course -- Course Number/Title

This course will be cross-listed with an

X undergraduate course (complete sections II, III, and IV below)
☐ existing graduate course (complete section IV below)

II. CURRICULUM DIFFERENCES – UNDERGRADUATE AND GRADUATE LEVELS

Please submit separate syllabi for both graduate and undergraduate courses

Syllabi for both undergraduate and graduate courses are attached X YES ☐ NO

Explain the differences between the syllabi in terms of requirements, learning objectives and course content

Graduate students will be expected to show mastery of the more theoretical aspects of the course. This will involve extra homework exercises, additional problems on exams, and a project, culminating in a report synthesizing material learned from the course. The project will involve reading and understanding primary literature in the field.
III. APPROVAL SECTION – GRADUATE COURSE WITH UNDERGRADUATE COURSE

Undergraduate Course Number / Title Math 460 Stochastic Processes

Names and Signatures:

Name of Department Chair of the Graduate Course: Dr. Robert Mignone

Signature __________________________ Date: 11/19/2014

Department Chair of the Undergraduate Course: Dr. Robert Mignone

Signature __________________________ Date: 11/19/2014

Graduate Program Director: Dr. Martin Jones

Signature __________________________ Date: 11/19/2014

Provost

Signature __________________________ Date: ____________________

IV. APPROVAL SECTION – GRADUATE COURSE WITH EXISTING GRADUATE COURSE

Graduate Course Number / Title of Existing Graduate Course: Math 660 Stochastic Processes

Program(s) of Existing Graduate Course: Master of Science in Mathematics

Names and Signatures:

“Host” Program Director:

Signature __________________________ Date: 11/14/2014

“Requesting” Program Director:

Signature __________________________ Date: 11/14/2014

Provost

Signature __________________________ Date: ____________________

Return form to the Graduate School Office for Further Processing
Signature of Chair of the Faculty Committee on Graduate Education, Continuing Education & Special Programs:

[Signature] Date: 1/27/2015

Signature of Chair of the Graduate Council:

[Signature] Date:

Signature of Faculty Senate Secretary:

[Signature] Date:

Date Approved by Faculty Senate:

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Math 461 Time Series
College of Charleston
Department of Mathematics
Fall 2013 Syllabus

INSTRUCTOR: Dr. Martin Jones
Office Hours: T.B.A.
Office: RSS 345
E-mail: jonesm@cofc.edu

Course Meetings: Mondays and Wednesdays in Maybank 224 from 7:00 - 8:15 PM.

Prerequisites: Math 430 Mathematical Statistics I or permission of the instructor.

Textbook: *Time Series Analysis and Its Applications, 3rd Edition* by Robert H. Shumway. In this course, we will cover selections from Chapters 1–7.

Course Description: Topics will include characteristics of time series, exploratory data analysis, ARIMA models, spectral analysis and filtering, state-space models, statistical methods in the frequency domain.

Student Learning Outcomes: After completing this course, students will be able to
1. Recognize and apply different time series models.
2. Understand the theory behind the construction of time series models.
3. Understand the proofs behind the theory of time series models.
4. Use time series methods to analyze real data sets.

These outcomes will be assessed in homework and on in class exams.

Graded Assignments: In this course, we will have one midterm exam, a final examination, and bi-weekly homework.

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<thead>
<tr>
<th>Graded Assignments</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Midterm</td>
<td>20%</td>
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<tr>
<td>Final Exam</td>
<td>20%</td>
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<tr>
<td>Homework</td>
<td>60%</td>
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Important Dates

<table>
<thead>
<tr>
<th>Important Dates</th>
<th>Date</th>
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<tbody>
<tr>
<td>Midterm</td>
<td>Wednesday, October 08</td>
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<tr>
<td>Final Exam</td>
<td>Wednesday, December 06</td>
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Course Grades: Midterm and Final Exams (20% each): These two in class exams will assess your understanding of the mathematical theory in the development of time series models. You will be expected to reproduce short proofs, show facility with the probabilistic tools, and be able to analyze time series data using these models.

Homework (60%): Every other week you will be expected to turn in assigned problems from the text. These problems may be a combination of theory ideas and applications.
Some will require the statistical software package R to aid in the calculations and analysis of time series data.

**Grading Scale:** Grades will be based on the percentage of points earned in the categories listed above. A (93-100%), A- (90-92%), B+ (87-89%), B (84-86%), B- (80-83%), C+ (77-79%), C (74-76%), C- (70-73%), D+ (67-69%), D (64-66%), D- (60-63%), F (below 60%).

**Attendance Policy**
You are expected to attend class every day. If you miss class, you will need to obtain notes from one of your classmates and talk with me about material that you do not understand. If for some reason you are not able to attend class the day that an assignment is due, you should email me your assignment that day. Late assignments will not be awarded full credit. Late assignments will not be accepted after graded papers are returned or problem solutions have been distributed. Make-up exams are only possible with proper documentation from the Absence Memo Office.

**Disability Policy**
If you have a documented disability that will affect your performance in this class, you should contact Disability Services (953-1431) and speak with me in private. No special testing accommodations can be made without a letter from Disability Services. It is the student’s responsibility to provide me with the accommodation envelope at least one week before any scheduled exam. Without exception, an examination must be taken at our scheduled class meeting time.

**Supplementary Material**
Supplementary materials for our course will be posted on OAKS.

**E-Mail**
The best way to contact me is by e-mail. Please always include your name, the course name, and the section number in your e-mails. In general, you should expect a response within two school days.

**Coverage of Topics**

**Weeks 1 and 2:** Characteristics of time series data, measures of dependence, stationary time series, estimation of correlation, multidimensional series.

**Week 3:** Classical regression in time series, exploratory data analysis, smoothing time series.

**Weeks 4 through 6:** Autoregressive moving average models, difference equations, autocorrelation and partial autocorrelation, forecasting, building ARIMA models, multiplicative seasonal ARIMA models.

**Weeks 7 through 9:** Cyclical behavior and periodicity, spectral density, periodogram and Fourier transforms, nonparametric and parametric estimation, multiple series and cross spectra, linear filters, wavelets, signal extraction and optimal filtering.

**Weeks 10 and 11:** Long memory ARMA models, unit root testing, GARCH models, threshold models, multivariate ARMAX models.

**Weeks 12 and 13:** Filtering and forecasting with state-space models, maximum likelihood estimation, missing data modifications, structural models, bootstrapping state-space models, stochastic volatility, Monte Carlo methods.

**Weeks 14 and 15:** Spectral matrices, regression for jointly stationary series, regres-
sion with deterministic inputs, random coefficient regression, cluster analysis, principal component and factor analysis, the spectral envelope.