New Course

Proposal Reference Number : 3718
PRN Alias : 11-12#674
Version No : 1
Submitted By : Ms Kathryn Lynn Livick

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	New Data
Program Affected?	Y
Program Change Form Submitted?	N (Simple Change) - Add as complementary course to the following programs: Honours Probability and Statistics Honours Statistics and Computer Science Major Statistics and Computer Science Minor Statistics Liberal Program - Core Science Component. Honours applied mathematics Honours Mathematics Honours Mathematics and Computer Science Major Mathematics Major Mathematics and Computer Science Minor Mathematics Liberal Program - Core Science Component Mathematics EXCEPTION - Some programs might mention "All 500 level courses, then no changes will be required.
Subject/Course/Term	MATH 545 • one term
Credit Weight or CEU's	4 credits
Course Activities	Schedule Type: A - Lecture; Hours per week: 3 Total Hours per Week : 3 Total Number of Weeks : 13
Course Title	Official Course Title : Intro to Time Series Analysis Course Title in Calendar : Introduction to Time Series Analysis
Rationale	The proposed course is an introductory course in time series analysis for upper level undergraduate and graduate students. The course offers more applied material and less technical detail than MATH 681. The course will have potential audiences amongst math, applied math and statistics undergraduates (particularly those with an interest in mathematical finance). The course may also attract students from other units, including Computer Science, Management, Biology, and Geography graduate students and undergraduates with minor or joint programs in mathematics or statistics.
Responsible Instructor	
Course Description	Stationary processes; estimation and forecasting of ARMA models; non-stationary and seasonal models; state-space models; financial time series models; multivariate time series models; introduction to spectral analysis; long memory models.

Teaching Dept.	0290 : Mathematics and Statistics
Administering Faculty/Unit	SC : Faculty of Science
Prerequisites	MATH 324 or MATH 357 or equivalent Web Registration Blocked? : N
Corequisites	
Restrictions	
Supplementary Calendar Info	
Additional Course Charges	
Campus	Downtown
Projected Enrollment	15
Requires Resources Not Currently Available	N
Explanation for Required Resources	
Required Text/Resources Sent To Library?	
Library Consulted About Availability of Resources?	
Consultation Reports Attached?	
Effective Term of Implementation	201209
File Attachments	No attachments have been saved yet.
To be completed by the Faculty	
For Continuing Studies Use	

Approvals Summary

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Version No.	Departmental Curriculum Committee	Departmental Meeting	Departmental Chair	Other Faculty	Curric/Academic Committee	Faculty	SCTP	Version Status
1								Submitted to Departmental Curriculum Committee for

MATH 545: TIME SERIES ANALYSIS
SYLLABUS

1. **INTRODUCTION**
1.1 Simple Stationary Models
1.2 Trends and Seasonality
1.3 Autoregressive Processes
1.4 Moving Average Processes
1.5 Forecasting
2. **ARMA MODELS: ESTIMATION AND FORECASTING**
2.1 Basic Properties
2.1.1 ARMA(p; q) models
2.1.2 Autocorrelation and Partial Autocorrelation Functions
2.1.3 Forecasting
2.2 Estimation and Model Selection
2.2.1 Method of Moments
2.2.2 Maximum Likelihood
2.2.3 Residual Checking
2.2.4 Model Selection
3. **NON-STATIONARY AND SEASONAL MODELS**
3.1 ARIMA Models
3.2 Unit Roots
3.3 Seasonal Models
3.4 Estimation, Hypothesis Testing and Forecasting
4. **STATE-SPACE MODELS**
4.1 State-Space Formulation
4.2 Structural Models
4.3 State-Space Formulation of ARIMA Models
4.4 Filtering and Smoothing: The Kalman Filter and EM Algorithm 1
5. **FINANCIAL TIME SERIES MODELS**
5.1 Parameter-Driven Models
5.2 Observation-Driven Models
5.3 Conditional Heteroscedastic Models: ARCH, GARCH and Stochastic Volatility.
6. **MULTIVARIATE TIME SERIES MODELS**
6.1 Multivariate Time Series Models
6.2 Multivariate ARMA Models
7. SPECTRAL ANALYSIS
7.1 Spectral Representations of Stationary Processes
7.2 Spectral Representations of ARMA Models
7.3 Estimation
7.3.1 Model-based/Parametric Estimation
7.3.2 Model-free Estimation: The Periodogram 2

Grading breakdown: Mark for the course will be the larger of:
15 % Coursework + 25 % Midterm + 60% Final
Or
15% Coursework + 85% Final

Textbooks: Introduction to Time Series and Forecasting (2nd Edition),
P. J. Brockwell and R. A. Davis
Time Series Analysis and its Applications with R Examples (3rd Edition),
R.H. Shumway and D. S. Stoffer.
Introductory Time Series with R,
P. S. P. Cowpertwait and A. V. Metcalfe