Hong Kong Baptist University
Faculty of Science
Department of Mathematics

Title (Units): ORBS7260 Applied Time Series (3,3,0)

Course Aims: This course introduces sophisticated statistical techniques and models for analyzing time series data.

Prerequisite: No

Prepared by: Michael Ng

Remark: This course is delivered by staff of HKBU.

Course Intended Learning Outcomes (CILOs):

Upon successful completion of this course, students should be able to:

No.	Course Intended Learning Outcomes (CILOs)
1	Explain the fundamental principles of different time series models
2	Identify suitable time series models for a given real-life problem
3	Apply time series analysis skills and techniques to analyze real-life data
4	Analyze findings in a scientific and concise manner

Teaching & Learning Activities (TLAs):

CILO	TLAs will include the following:
1,2,3,4	Lectures with rigorous mathematical discussions and concrete examples. The lecturer will constantly ask questions in class to make sure that the majority of students are following the teaching materials.
1,2,3,4	Assignments to monitor both students' learning and mastering of the taught materials. In addition, common mistakes will also be addressed and analyzed.

Assessment:

No.	Assessment Methods	Weighting	CILO Addressed	Remarks
1	Assignments	40%	all	Assignments are designed to measure students' understanding of the theory, techniques, and applications of time series analysis. Assignments are conducted to monitor the students' understanding of the theory, techniques and skills taught in the class. This may involve, but not limited to, in-class discussions of rigorous technical problems and their solutions.
2	Final Examination	60%	all	Final Examination is designed to see how far students have achieved their intended learning outcomes especially in the knowledge domain. Students should have a thorough understanding of the knowledge and apply them correctly in different context to do well in the exam.

Course Intended Learning Outcomes and Weighting:

Content	CILO No.	Teaching (in hours)
1. Introduction	1	8
2. Stationary time-series models	1,2,3	12
3. Modeling volatility	1,2,3	8
4. Models with trend	1,2,3	6
5. Advanced topics	1,2,3	8

References:

1. Walter Enders, *Applied Econometric Time Series*. 2nd edition, New York, Wiley, 2004.
2. Wayne A. Fuller, *Introduction to Statistical Time Series*, 2nd edition, New York, Wiley, 1996.
3. Terence C. Mills, *The Econometric Modelling of Financial Time Series*, 2nd edition, Cambridge: Cambridge University Press, 1999.
4. P.J. Brockwell and R.A. Davis, *Introduction to Time Series and Forecasting*, Springer, 1996.
5. B. Abraham and J. Ledolter, *Statistical Methods for Forecasting*, Wiley, 1983.
6. G.E.P. Box, G.M. Jenkins and G.C. Reinsel, *Time Series Analysis: Forecasting and Control*, Prentice-Hall International, 1994.
7. J.D. Cryer, *Time Series Analysis*, Duxbury Press, 1986.
8. W.W.S. Wei, *Time Series Analysis: Univariate and Multivariate Methods*, Addison-Wesley, 1990.
9. Shumway, Robert H, *Time series analysis and its applications*, New York : Springer, 2000.
10. Yaffee, Robert A. *Introduction to time series analysis and forecasting with applications of SAS and SPSS*, San Diego, Academic Press, 2000.
11. Chan, Ngai Hang, *Time series : applications to finance*, New York : Wiley Interscience, 2002.

Course Content in Outline:

Topic	Hours
1. Introduction	8
A. Time series data	
B. Moving averages and exponential smoothing	
2. Stationary time-series models	12
A. ARMA model	
B. ACF and partial ACF	
C. Stationarity and invertibility	
D. Box and Jenkins model selection	
E. Parameter estimation	
F. Diagnostic checking	
G. Forecasting	
H. Seasonality	
3. Modeling volatility	8
A. Financial time series	
B. Heteroskedasticity	
C. ARCH and GARCH	
D. Estimation and testing	
4. Models with trend	6
A. Difference equations	
B. Non-stationarity	
C. ARIMA model	
D. Seasonality	
5. Advanced topics	8
A. Multivariate time series	
B. Long memory processes	
C. Data Mining	

(Approved by the Science Faculty Board Meeting 31 October 2023)
(Approved by the Department Management Committee on 5 September 2023)