City University of Hong Kong
Course Syllabus

offered by College/School/Department of _Mathematics_____
with effect from Semester __A____ 20_20_ / _21_

Part I Course Overview

Course Title:	**Introduction to Time Series and Forecasting**
Course Code:	**MA4543**
Course Duration:	**One semester**
Credit Units:	**3 credit units**
Level:	**B4**
Proposed Area: *(for GE courses only)*	☐ **Arts and Humanities** ☐ **Study of Societies, Social and Business Organisations** ☐ **Science and Technology**
Medium of Instruction:	**English**
Medium of Assessment:	**English**
Prerequisites: *(Course Code and Title)*	**MA2506 Probability and Statistics, or** **MA2510 Probability and Statistics**
Precursors: *(Course Code and Title)*	**MA3518 Applied Statistics**
Equivalent Courses: *(Course Code and Title)*	**Nil**
Exclusive Courses: *(Course Code and Title)*	**Nil**

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course aims to introduce the basic concepts of Time Series and the commonly used forecasting techniques. It helps students apply various techniques to solve real-life forecasting problems.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	explain the basic concepts of time series and distinguish the procedures between different forecasting techniques;	40%	✓	✓	
2.	identify the best method or model for producing forecasts;	30%		✓	✓
3.	employ computer software SAS for implementing forecasting techniques to solve real-life problems.	30%		✓	✓
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3				
Lectures	Learning through **teaching** is primarily based on lectures.	✓	✓	✓				39 hours in total
Take-home assignments	Learning through **take-home assignments** helps students understand principles and techniques of time series and forecasting methods, and recognize the applications in practical problems.	✓	✓	✓				after-class

Project(s)	Learning through **project(s)** helps students implement mathematical and computational ideas of time series and forecasting techniques to a concrete application. It also helps students to communicate and collaborate effectively in the team.		✓	✓				after-class

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

50% Coursework
50% Examination (Duration: 3 hours, at the end of the semester)

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3					
Continuous Assessment: _50___%								
Qizzes/Tests	✓	✓	✓				20-30%	Questions are designed for the course to see how well students have learned techniques of time series and forecasting in solving application problems.
Hand-in assignments	✓	✓	✓				0--10%	These are skills based assessment which enables students to implement methods of time series and forecasting as well as techniques of smoothing and decomposition in diverse applications.
Project		✓	✓				20%	Students are assessed on their ability in applying computational methods of time series and forecasting to handle a real-life problem, as well as on the presentation of results with analysis.
Examination: _50___% (duration: 3 hrs, if applicable)								Examination questions are designed to see how far students have achieved their intended learning outcomes. Questions will primarily be skills and understanding based to assess the student's versatility in time series and forecasting.
** The weightings should add up to 100%.*							100%	

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Qizzes/Tests	Ability in problem solving	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Hand-in assignments	Understanding of concepts and applications	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Project	Creativity and Team work ability	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Examination	Comprehensive ability in independent problem solving	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

Introduction to Forecasting

An overview of time series and forecasting methods. Forecasting accuracy and forecasting error.

Smoothing and Decomposition Methods

Simple and double moving averages. Simple and double exponential smoothing. Smoothing models for seasonal data. Additive and multiplicative decomposition methods.

Regression Models

Forecasting using simple and multiple regression models.

Univariate Time Series Models

Stationarity of time series. Transformation for achieving stationarity. Autocorrelations and partial autocorrelations. Autoregressive models. Moving average models. ARIMA mixed models. Box-Jenkins methodology of model building.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Bowerman B L, O'connell R T and Koehler A B, Forecasting, Time Series and Regression: An Applied Approach, 4/e, Thomson, 2005
2.	Hanke J E and Wichern D W, Business Forecasting, 8/e, Prentice Hall, 2005
3.	DeLurgio S A, Forecasting Principles and Applications, McGraw Hill, 1998
4.	Makridakis S, Wheelwright S C and Hyndman R J, Forecasting: Methods and Applications, 3/e, Wiley, 1998
5.	Box G E P, Jenkins G M, and Reinsel G C, Time Series Analysis, Forecasting and Control, 4/e, Prentice-Hall, 2008

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

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2.	
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