MA4543: INTRODUCTION TO TIME SERIES AND FORECASTING

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Introduction to Time Series and Forecasting

Subject Code
MA - Mathematics
Course Number
4543

Academic Unit
Mathematics (MA)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
MA2506 Probability and Statistics, or
MA2510 Probability and Statistics

Precursors
MA3518 Applied Statistics

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

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.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	explain the basic concepts of time series and distinguish the procedures between different forecasting techniques;	40	x	x	
2	identify the best method or model for producing forecasts;	30		x	x
3	employ computer software SAS for implementing forecasting techniques to solve real-life problems.	30		x	x

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 real-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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures	Learning through teaching is primarily based on lectures.	1, 2, 3	39 hours in total
2	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.	1, 2, 3	after-class

3	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.	2, 3	after-class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Qizzes/Tests	1, 2, 3	20	Questions are designed for the course to see how well students have learned techniques of time series and forecasting in solving application problems.
2	Hand-in assignments	1, 2, 3	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.
3	Project	2, 3	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.

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

3

Additional Information for ATs

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 Rubrics (AR)

Assessment Task
1. Qizzes/Tests

Criterion
Ability in problem solving

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
2. Hand-in assignments

Criterion
Understanding of concepts and applications

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
3. Project

Criterion
Creativity and Team work ability

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
4. Examination

Criterion
Comprehensive ability in independent problem solving

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

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.

Reading List

Compulsory Readings

	Title
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

Additional Readings

	Title
1	Nil