

# ISOM 4540 Time Series Analysis and Forecasting

## Course Outline

### Instructor

Inchi Hu, Chair Professor of ISOM, Room 4436, Tel: 2358-7734  
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### Teaching Assistant

Yvonne Chan, [imywchan@ust.hk](mailto:imywchan@ust.hk); Juncheng Li

### Tutorials

The weekly tutorial will go over assignments and supplementary materials. The tutorials will begin in the second week.

All lecture notes, assignments, solutions, old exam papers, and important announcements will be posted on CANVAS

### Course Objective

The objective of this course is to equip students with various forecasting techniques and knowledge on modern statistical methods for analyzing time series data. The course consists of three parts: I. Univariate methods; II. Regression methods; III. ARIMA models.

### Intended Learning Outcomes

Upon completion of the course, you should be able to

- Understand the fundamental advantage and necessity of forecasting in various situations.
- Know how to choose an appropriate forecasting method in a particular environment.
- Know how to apply various forecasting methods, which includes obtaining the relevant data and carrying out the necessary computation (running suitable statistical software, if necessary).
- Improve forecast with better statistical models based on statistical analysis

### Teaching Method

The method is lecturing aided by directed discussion. The context of the relevant concepts and methods will be presented first followed by the discussion of pre-designed questions and examples to explore the concepts and methods in depth.

### Course Materials:

- “Forecasting and Time Series”, 4<sup>th</sup> Edition, by Bowerman and O’Connell, Duxbury
- Additional materials (lecture notes and business cases) will be available from course website.

### **Assessment scheme**

Your grade is based on the following components:

- The midterm exam: an in-class, closed-book, written exam.
- The final exam;
- Assignments: There are two types of assignments: individual-based and group projects. All assignments will be collected and returned by your TA during tutorial sessions.
- Participation is crucial to a lively and effective learning environment. It will be used as “tie-breaker”.

### **Course Content**

#### Part I: Univariate methods

- Setting the stage
- Simple smoothing methods
- Decomposition method
- Holt’s and Winters’ smoothing methods

#### Part II: Regression Methods

- Review simple regression
- RMSE and Coefficient of Determination
- Introduction to Multiple Regression
- Statistical Inference in Multiple Regression
- Comparative Analysis Using Regression
- Variable Selection in Multiple Regression
- Model Selection in Regression
- Checking Regression Models
- Autocorrelation in Regression

#### Part III: Box-Jenkins Methods

- Introduction to Time Series Modelling
- ARMA Models
- Identification of ARMA models
- ARIMA Models
- ARIMA Models Identification
- Building better models from ARIMA
- Parameter Estimation and Diagnostic checking
- Forecast using ARIMA models
- Modelling Seasonal Data
- Intervention Analysis