# Hong Kong Baptist University Faculty of Science Department of Mathematics

# Title (Units): MATH7830 Machine Learning and Forecasting (4,3,1)

**Course Aims:** In this course, students will learn about the fundamentals of machine learning and forecasting techniques and gain hands-on experience with analysing and solving a variety of problems encountered in industrial development.

### Prerequisite: No

Prepared by: Luo Dehui

Remark: This course is delivered by staff of University of Kent.

### **Course Intended Learning Outcomes (CILOs):**

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

No.	Course Intended Learning Outcomes (CILOs)						
1	Explain advanced knowledge of the types of data analysis problems that can be appropriately						
	dealt with using machine learning and forecasting techniques.						
2	Understand and critically discuss research issues within the area of machine learning and						
	forecasting.						
3	Successfully develop machine learning and forecasting models and apply them to real-world						
	problems related to economic development.						

### **Teaching & Learning Activities (TLAs):**

CILO	TLAs will include the following:
1, 2	New concepts will be introduced in lectures, together with instructions and any requisite
	theory. Where possible, theory will be demonstrated using practical examples.
1, 2, 3	Computer terminals will afford students the opportunity of putting theory into practice and
	will include learning how to perform statistical analyses using SPSS and Excel.

#### Assessment:

No.	Assessment Methods	Weighting	CILO Addressed	Remarks
1	Project	100%	all	The course will be assessed 100% by coursework
				covering all content taught in the course. Students
				will be given a real-world dataset and asked a series
				of questions in which they must perform various data
				mining and forecasting techniques and provide
				written commentaries. The coursework will assess
				students' comprehension of key topics introduced in
				the course, as well as require them to demonstrate
				their model building and analytical skills.

# **Course Intended Learning Outcomes and Weighting:**

Content	CILO No.	Teaching (in hours)
1. Machine learning	1,2,3	14
2. Forecasting	1,2,3	13
3. Data analysis	1,2,3	14

### **References:**

- 1. Box, G.E.P., Jenkins, G.M., Reinsel, G.C., Ljung, G.M. (2015) *Time Series Analysis: Forecasting and Control*, 5th Edn. Hoboken: Wiley. (ISBN: 978-1118674918)
- 2. James, G., Witten, D., Hastie, T., Tibshirani, R. (2013) An Introduction to Statistical Learning with Applications in R. New York: Springer. (ISBN 978-1461471370)
- 3. Hyndman, R.J., Athanasopoulos, G. (2018) *Forecasting: Principles and Practice*. OTexts. (ISBN 978-0987507112)
- 4. Witten, I.H., Eibe, F. (2011) *Data Mining: Practical Machine Learning Tools and Techniques*, 3rd Edition. San Francisco: Morgan Kaufmann. (ISBN: 978-0123748560).

# **Course Content in Outline:**

- 1. Machine learning: The introduction of modern machine learning techniques used in business data analysis, including both supervised learning (e.g. regression, classification, and artificial neural networks) and unsupervised learning (e.g. association rule discovery and cluster analysis).
- 2. Forecasting: Students will learn about various forecasting methods, including exponential smoothing methods and the Box-Jenkins method (i.e. the ARIMA model and variants).
- 3. Data analysis report writing. Students will systematically carry out a data analysis project and write a data analysis report.

The data analysis packages such as R, SPSS, and Weka may be used in this module.

(Approved by the Science Faculty Board Meeting on 27 February 2025) (Approved by the Department Management Committee on 26 January 2025)

(Approved by the Science Faculty Board Meeting by circulation in August 2024) (Approved by the Department Management Committee on 7 August 2024)