City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester A in 2020/2021

Part I Course Overview

Course Title:	Data Engineering and Learning Systems
Course Code:	EE4146
Course Duration:	One Semester (13 weeks)
Credit Units:	3
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)*	(MA3001 Differential Equations or EE3121 Differential Equations for Electrical Engineering) or (EE2203 or EE3211 Modelling Techniques) or (MA3160 Probability and Stochastic Processes or EE3331 Probability Models in Information Engineering)
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course aim is to introduce the concept, techniques and fundamental background to informatics and learning systems.

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.	Describe the current learning system and technology used in engineering and IT industries		√	√	
2.	Describe the current learning systems and methodologies used in engineering, IT and data industries		√	√	
3.	Describe the use of supervised and unsupervised learning methods for engineering, IT and data engineering problems		√	√	
4.	Analyze practical data engineering problems using supervised or unsupervised learning methods		√	√	
		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	4			
Lecture	Key concepts are described and illustrated	√	√	√	√			26 hrs
Tutorial	Provide computation and computer exercises to illustrate major concepts gone through in lectures.	√	√	√	√			13 hrs

4. Assessment Tasks/Activities (ATs)

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

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3	4				
Continuous Assessment: 50 %								
Tests (min.: 2)	✓	✓	✓	✓			35%	
#Assignments (min.: 3)	✓	✓	✓	✓			15%	
Examination: 50% (duration: 2 hrs , if applicable)								
Examination	✓	✓	✓	✓			50%	
** The weightings should add up to 100%.*							100%	

Remark:

To pass the course, students are required to achieve at least 30% in course work and 30% in the examination.

may include homework, tutorial exercise, project/mini-project, presentation

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. Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels

6. Constructive Alignment with Major Outcomes

MILO	How the course contribute to the specific MILO(s)
1	An ability to apply knowledge of mathematics, science and data engineering
3	An ability to analyze a system, or process that conforms to a given specification within realistic constraints
5	An ability to identify, evaluate, formulate and solve engineering and IT problems

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

1. Keyword Syllabus

Introduction to Learning Systems

Understand data engineering methodologies, learning systems and its analysis; formulate an IT/business/engineering problem from the perspective of learning systems; understand fundamental concepts in data engineering and classification; recognize issues in practical data engineering and IT problems.

Emerging Learning System Technology

Introduction to Learning-system-Based Technology: Statistical methods such as Discriminant Analysis, and Principal Component Analysis; Supervised learning such as Naïve Bayes classifier, K Nearest Neighbour, and neural networks; Unsupervised learning approaches such as Self-Organizing Map, and Clustering; High Dimensionality Reduction such as linear discriminant analysis (LDA), manifold learning, and feature selection methods; Diagnostic Analysis, and Practical Case Study.

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.	N/A

2.2 Additional Readings

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

1.	Richard O. Duda, Peter E. Hart, David G. Stork, Pattern Classification, Wiley
2.	Trevor Hastie, Robert Tibshirani, Jerome Friedman, The elements of statistical learning data mining, interface and prediction, Springer
3.	T. Kohonen, Self-Organizing Maps, Springer, Third edition
4.	Tommy W. S. Chow and S. Y. Cho, Neural Networks and Computing: Learning algorithms and applications, (Imperial College Press, 2008)
5.	Artificial Intelligence: Modern Approach (2nd Edition) Prentice Hall, Stuart J. Russell and Peter Norvig