City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester A 2022/2023

Part I Course Overview

Course Title: Multi-Dimensional Data Modeling and its Applications

Course Code: EE6435

Course Duration: One Semester (13 weeks)

Credit Units: 3

Level: P6

Medium of Instruction: English

Medium of Assessment: English

Prerequisites:
(Course Code and Title) Nil

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 aims to provide a fundamental understanding of multiple dimensional modeling and analysis techniques. The focus will be general modeling and methods for managing and analyzing large datasets, which are produced by different modern technologies. As we are living in the midst of a data explosion, the goal of this course is to equip the students with the ability to convert data into knowledge.

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 concept of multiple types of data and data modelling techniques.		✓		
2.	Explain the basic operations that can be performed on a multi-dimensional data model and the analytical functionalities.		✓	✓	
3.	Identify and perform the steps involved in converting data into knowledge.		✓	✓	✓
4.	Demonstrate how the multi-dimensional data models are used in decision making and analysis using real applications.		✓	✓	✓
		100%			

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 of multi-dimensional data modelling are described and illustrated	✓	✓	✓	✓			3 hrs/wk
Assignment	Each student is required to work independently on 2-3 assignments. Each assignment contains several questions designed to help students reinforce the concepts/methods learned.		✓	✓	✓			
Mini-project	Each student is required to apply data analysis techniques on given datasets. Students need to implement at least one general data analytic skill offered in this course.				✓			

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: <u>50%</u>								
Tests (min.: 2)	✓	✓	✓				30%	
#Assignments (min.: 3)	✓	✓	✓	✓			20%	
Examination: 50<u>%</u> (duration: 2 hrs , if applicable)								
Examination	✓	✓	✓				50%	
							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.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B,)	Marginal (B-, C+, C)	Failure (F)
1. Examination	Achievements in CILOs	High	Medium	Low	Not even reaching marginal level
2. Coursework	Achievements in CILOs	High	Medium	Low	Not even reaching marginal level

Applicable to students admitted before Semester A 2022/23

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

6.   Constructive Alignment with Programme Outcomes

PILO	How the course contribute to the specific PILO(s)
1,2,3	The course provides students with opportunities in acquiring knowledge of multi-dimensional data modelling techniques, and also the applications of mathematics and engineering problem solving skills which are central to the aims of this program.
4, 5	Students are required to complete a min-project designed to gain practical experience in implementing a general data analysis techniques. The analytical and research skills developed are central to the aims of this program.

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

1.   Keyword Syllabus

Fundamental of multi-dimensional model
online analytical processing; data structures; data analysis.

Basic operations on BIG data sets
Statistical learning, clustering, classification, similarity search, EM, Markov model, Bayes models.

Application of multi-dimensional model
The mini-projects in the case studies are designed to complement the lecture aspects of the course, and to gain practical experience by applying multi-dimensional analysis tools targeting the information technology industry. The mathematical and engineering skills developed are central to the aims of this course.

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.	P. Tan, M. Steinbash, V. Kumar and A. Karpatne, Introduction to Data Mining. Second edition, Global edition. New York: Pearson, 2019 [E-book]

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