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:	Foundations of Data Engineering
Course Code:	EE3001
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	B3
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)*	MA1200 Calculus and Basic Linear Algebra I, or MA1300 Enhanced Calculus and Linear Algebra I
Precursors: *(Course Code and Title)*	MA1201 Calculus and Basic Linear Algebra II, or MA1301 Enhanced Calculus and Linear Algebra II
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

The aim of this course is to provide students with an understanding of the basic probability and statistical techniques used in data engineering.

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.	Apply probability techniques for modelling and understanding data		√	√	
2.	Apply statistical tools to analyse data and understand their physical meanings and implications		√	√	
3.	Acquire a basic understanding of how the techniques learnt can be applied to data engineering applications		√	√	
		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				
Lecture and Tutorials, including some Tutorials in laboratory	Key concepts are explained during lecture. Students work on questions during tutorial. A deeper understanding is also achieved through discussions. Tutorial sessions are conducted in laboratory to introduce relevant useful software	√	√	√				3 hrs/wk (2 hrs Lect, 1 hr Tut)

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					
Continuous Assessment: 50%								
Tests (min.: 2)	✓	✓	✓				30%	
#Assignments (min.: 3)	✓	✓	✓				20%	
Examination: 50% (duration: 2hrs , 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 mini projects, in-class assignments, and homework assignments.

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 basic knowledge of mathematics, science and engineering for solving engineering problems.
2	An ability to design and conduct experiments as well as to analyze and interpret data.
10	An ability to use necessary engineering tools.

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

1. Keyword Syllabus

Introduction
A bird eye's view of the course with an emphasis on probabilistic and statistical techniques and tools for data engineering applications, and the use and possible mis-uses.

Probability models for data engineering
Essential concepts in probability, Bayes' reasoning, Markov and Chebyshev's inequality, representation of data and events as random variables, popular probability distributions in data engineering, ways to represent relationships between random variables, sampling methods

Statistical tools and their data engineering applications
Statistical descriptors, parameter estimation, parametric and non-parametric hypothesis testing, correlation, linear regression and model building, prediction, useful engineering tools and software, assumptions, precautions and limits of statistics, common pitfalls in interpreting data

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.	S.M. Ross, *Introduction to Probability and Statistics for Engineers and Scientists*, 5th Ed., 2014 (e-book).

2.2 Additional Readings

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

1.	D. Wackerly, W. Mendenhall, and R.L. Scheaffer, *Mathematical statistics with applications*, 7th Ed., 2007.
2.	N.J. Salkind, *Statistics for people who hate statistics,* 4th Ed., 2017.
3.	R.E. Walpole et al., *Probability and statistics for engineers and scientists*, 9th Ed., 2014.