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 Information Systems and Data Analysis
Course Code:	EE1004
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	B1
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)*	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 is designed to introduce the students to concepts, impacts, and basic principles of data and information systems. Applied examples will be introduced, analysed, solved. The laboratories of this course will cover introductory probability problems and statistics of real-life data, geometric transformation, and applications of eigenvalues and eigenvectors to data analysis.

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.	Explain mathematical concepts on topics of linear algebra, including vectors, matrices, linear equations, etc in engineering applications.		✓	✓	
2.	Describe basic statistical methods in engineering applications.		✓	✓	
3.	Describe engineering data modeling and random variables		✓	✓	
4.	Analyze data using basic statistics and probability theories		✓	✓	
		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 and Tutorials	Lectures on various fundamental knowledge and concepts in information systems	✓	✓	✓	✓			3 hrs/wk (2 hrs Lect, 1 hr Tut)
Tests	To test the students' understanding on lecture materials.	✓	✓	✓	✓			
Laboratories	Computational labs to reinforce key concepts covered in lectures and tutorials	✓	✓	✓	✓			2 hrs/wk (3 weeks)

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) and short tests	√	√	√	√			30%	
# Assignments and Lab Assignments (total: 5)	√	√	√	√			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 coursework 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

Please state how the course contribute to the specific MILO(s)

MILO	How the course contribute to the specific MILO(s)
1,3	This course will introduce fundamental topics in information and data engineering and their applications.
5	Application examples are used to illustrate how engineering problems can be formulated and solved.

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

1. Keyword Syllabus

Introduction to Data and Information Systems

Numerical and non-numerical data; Signals and images; Graphs: nodes, edges, adjacency matrix.

Basic Computational Engineering and Linear Algebra

Introduction to computational engineering and modeling of physical systems; Vectors: inner and outer products; Matrices: matrix multiplications, determinants, inverse of a matrix; System of linear equations; Eigenvector and Eigenvalues; Application to geometric image transformations.

Information System and Data Statistics and Probability

Introduction to modeling of information and engineering systems using basic statistics and probability; Summarizing data sets: measures of center and measures of variation; Sample space and events, basic laws of probability, conditional probability; Application to engineering problems.

Engineering Data Modeling and Random Variables

Introduction to Information and engineering systems data modeling; The ideas of summation and integration; probability mass function, probability density function, common random variables (e.g., binomial, Poisson, Gaussian), expectation and variance; Joint distribution functions, independent random variables, covariance, and correlation; Application to data modeling.

Basic Engineering Statistical Methods

Sampling distributions and basic point estimates, confidence intervals for a population mean; Hypothesis testing: the null and the alternative hypotheses, two types of errors, p values; Application to engineering data analysis.

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.	Erwin Kreyszig, Advanced Engineering Mathematics, 10th ed., Wiley, 2011

2.2 Additional Readings

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

1.	Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, 5th ed., Academic Press, 2014.
2.	Stephen Boyd and, Lieven Vandenberghe, Introduction to Applied Linear Algebra: Vectors, Matrices, and Least Squares, Cambridge University Press, 2018.
3.	Ernest Davis, Linear Algebra and Probability for Computer Science Applications, CRC Press, 2012.
4.	Steven J. Leon, Linear Algebra with Applications, 9th ed., Pearson, 2014.