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 Digital Techniques
Course Code:	EE1001
Course Duration:	One Semester
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 aimed at providing students with an understanding of the basic mathematical and fundamental concepts required for Foundations of Digital Techniques.

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 symbolic logic to determine the validity of arguments.		✓	✓	
2.	Explain the basic concepts of sets and functions.		✓	✓	
3.	Apply methods of proof to determine and demonstrate the truth or falsity of mathematical statements.		✓	✓	
4.	Manipulate numbers in binary form for digital systems.		✓	✓	
5.	Analyze and design simple combinatorial logic circuits.		✓	✓	
6.	Use combinatorial methods to solve counting problems.		✓	✓	
7.	Analyze the structures of sequences and series.		✓	✓	
		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	5	6	7	
Lecture	Large group in-class activity involving the entire class	✓	✓	✓	✓	✓	✓	✓	13 weeks of 2 hrs Lecture
Tutorial	Discussion and demonstration activities	✓	✓	✓	✓	✓	✓	✓	13 weeks of 1 hr Tutorial
Laboratory	Apply and practise the skills for circuit implementation					✓			3 weeks of 2 hrs Lab

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	5	6	7		
Continuous Assessment: 50%									
Tests(min.: 2)	✓	✓	✓	✓	✓	✓	✓	30%	
#Assignments (min.: 3)	✓	✓	✓	✓	✓	✓	✓	10%	
Lab Exercises/Reports					✓			10%	
Examination: 50%									
Examination (duration: 2hrs , if applicable)	✓	✓	✓	✓	✓	✓	✓	50%	
** The weightings should add up to 100%.*								100%	

Remark:

To pass the course, students are required to achieve at least 30% in the coursework and 30% in the examination. Also, 75% laboratory attendance rate must be obtained.

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

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)
Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels
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	Apply knowledge of mathematics, science and engineering.
2	Design and conduct experiments as well as to analyze and interpret data.
3	Design a system, component, or process that conforms to a given specification within realistic constraints.
5	Identify, evaluate, formulate and solve engineering problems.
7	Communicate effectively.
10	Use necessary engineering tools.

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

1. Keyword Syllabus

Numbers

Number Systems: Integers, rational numbers, real numbers; Number representation methods: signed and unsigned binary numbers, hexadecimal, binary coded decimal, fixed-point numbers, floating-point numbers; binary arithmetic, floating-point arithmetic.

Sets

Sets, subsets, cardinality, set operations: union, intersection, complement; Venn diagrams, Cartesian product, power sets.

Logic

Logic connectives, truth tables, conditionals, necessary and sufficient conditions, validity and soundness of arguments, rules of inference, universal and existential quantifiers, nested quantification.

Functions

Definition of functions, injection, surjection, bijection, inverse functions, composition of functions; polynomial and rational functions, exponential and logarithmic functions, graphs of functions, growth of functions, big-O notation.

Boolean Algebra

De Morgan's Laws, duality principle, Boolean functions, switching functions, logic gates, simple logic circuits.

Methods of Proof

Direct proof methods, counter-examples, indirect proof methods: contradiction and contraposition, mathematical induction.

Sequences and Series

Explicit formula for sequences, summation and product notation, arithmetic series, geometric series, recursive definition of sequences, solving simple recurrence relations.

Counting

Combination, permutation, the Binomial Theorem, the inclusion-exclusion principle, the pigeon-hole principle.

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.	Nil

2.2 Additional Readings

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

1.	Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Brooks Cole, ISBN 978-1111775780, 2011.
2.	Rowan Garnier and John Taylor, Discrete Mathematics for New Technology, 2nd ed., Taylor & Francis, 2001.
3.	Alan B. Marcovitz: Introduction to Logic Design, Third Edition, ISBN 978-0-07-016490-1 (McGraw-Hill Higher Education 2010).
4.	Tom Jenkys and Ben Stephenson, Fundamentals of Discrete Math for Computer Science: A Problem-Solving Primer, 2nd ed., Springer, 2018.