City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester A in 2024/2025

Part I Course Overview

Course Title:	Signal Processing
Course Code:	EE5410
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	EE3008 Principles of Communications or EE3112 Signal Analysis or EE3210 Signals and Systems; or equivalent.
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 a solid foundation in signal processing, and to facilitate students to solve real-world problems by signal processing 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.	Recognize properties of continuous-time and discrete-time signals and systems.		✓		
2.	Explain the relationship among different transforms in signal processing.		✓		
3.	Analyse discrete-time systems and calculate system parameters using appropriate transforms.		✓	✓	
4.	Design and realize digital filters.		✓	✓	
5.	Apply signal processing techniques for solving science and engineering problems.		✓	✓	✓
		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 real-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. Learning and Teaching Activities (LTAs)

(LTAs designed to facilitate students' achievement of the CILOs.)

LTA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5		
Lecture	Fundamental concepts of signal processing are described and demonstrated.	✓	✓	✓	✓			
Work-along examples, in-class exercise	Key concepts are worked out based on questions and problem solving	✓	✓	✓	✓			
Mini-projects	Mini-projects in terms of exercises (e.g. based on MATLAB) are designed for students to apply the knowledge learned from the course to tackle real-world problems.			✓	✓	✓		
Assignments	Standard assignments are used for consolidating the concepts and knowledge learned from the 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	5			
Continuous Assessment: 50 %								
Tests (min.: 2)	✓	✓	✓	✓	✓		30 %	
#Assignments (min.:3)	✓	✓	✓	✓	✓		20 %	
Examination: 50 % (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 before Semester A 2022/23 and in Semester A 2024/25 & thereafter

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

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

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

6. Constructive Alignment with Programme Outcomes

PILO	How the course contribute to the specific PILO(s)
1,2,3	The course provides students with ample opportunities in acquiring knowledge of signal processing as well as applications of mathematics and engineering problem solving skills, which are central to the aims of this program.
4,5	Students are required to complete assignments designed to apply signal processing techniques for solving real-world problems. 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

Analog and Digital Signal Analysis
Analog Signal Analysis, Sampling and Reconstruction of Continuous-Time Signals, z-Transform, Fourier Transform of Discrete-Time Signals, Discrete Fourier Transform, Fast Fourier Transform.

Design and Implementation of Digital Filters
Linear Time-Invariant Systems and Transform Analysis, Structure for Discrete-Time Systems, Design of Finite Impulse Response and Infinite Impulse Response Filters, Implementation Considerations.

Selected Topics
Encoding and Decoding, Estimation Theory, Optimal and Adaptive Filtering, Signal Detection, Spectral 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.	Course materials at the departmental Web.

2.2 Additional Readings

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

1.	H. C. So, Digital Signal Processing: Foundations, Transforms and Filters, with Hands-on MATLAB Illustrations, McGraw-Hill, 2010
2.	A.V. Oppenheim and R.W. Schafer, Discrete-Time Signal Processing, 3rd Edition, Pearson, 2009
3.	V.K. Ingle and J.G. Proakis, Digital Signal Processing Using MATLAB, 4th Edition, Cengage Learning, 2016
4.	S. K. Mitra, Digital Signal Processing: A Computer-Based Approach, 4th Edition, McGraw-Hill, 2011
5.	J. G. Proakis and D. G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, 4th Edition, Prentice-Hall, 2007
6.	S. Haykin, Adaptive Filter Theory, 5th Edition, Pearson, 2014