City University of Hong Kong
Course Syllabus

offered by Department of Electronic Engineering
with effect from Semester B in 2017/2018

Part I Course Overview

Course Title:	Advances in Digital Signal Processing
Course Code:	EE6802
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	EE5410 Signal Processing; or EE5802 Digital Signal Processing (old code IT5302); or equivalent
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

The course aims to provide students with theoretical and practical knowledge in selected topics of Advanced Digital Signal Processing, oriented toward contemporary research and practice in signal processing and related technologies.

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 essence of Digital Signal Processing. Gain advanced skills in continuous-time and discrete-time sampling. Apply DFT techniques for fast computation.		✓	✓	✓
2.	Describe the concepts, apply mathematical formulations and framework of Digital Signal Processing and their essential building blocks.		✓	✓	✓
3.	Develop skills in multirate filterbank processing systems. Express and apply techniques in Digital Signal Processing.		✓	✓	✓
4.	Apply and integrate knowledge in practice.		✓	✓	✓
		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	Fundamental concepts, essential techniques, and key algorithms are presented.	✓	✓	✓	✓			2 hrs/wk
Tutorial	Key concepts and techniques are strengthened by working on closely related problems.	✓	✓	✓				1hr/wk (*Some of the tutorials will be conducted in the laboratory)*
Assignments	Develop skills by problem solving.	✓	✓	✓				
Mini project	Mini-projects are designed for students to gain practical experience in real world design problems.			✓	✓			

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%								
At least 3 assignments (homework assignments, mini projects etc.)	✓	✓	✓	✓			50%	
Examination: 50% (duration: 2hrs)								
							100%	

Remark:

To pass the course, students are required to achieve at least 30% in course work and 30% in the examination.

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 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 adequate opportunities in acquiring knowledge of the Digital Signal Processing technologies, and familiarize with the applications of mathematics and engineering problem solving skills The learning experience will be enhanced and broadened by case studies on latest developments in the field.
4, 5	Students are required to work on mini-projects to gain practical experience in implementing real world Digital Signal Processing applications.

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

1. Keyword Syllabus

Essence of Digital Signal Processing
Fourier and z Transform, Sampling and Reconstruction, Discrete Sampling, DFT, FFT.

Fundamentals of Multi-rate System
Decimation, Interpolation, Aliasing Error, Polyphase Components, Equivalent Structures, Signal Analysis and Compression, LPTV Systems Analysis.

Advance Multi-rate Signal Processing
2 Bank Filter, Regular Binary Subband Tree Structure, M-bank Structure, Perfect Reconstruction (PR), Higher Order PR System.

Advanced Topics and Applications
Forward and Inverse Wavelet Transform, Wavelet families, Multi-resolution analysis, EZW Coding, Application in Image Processing and Compression, Case Studies.

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.P. Vaidyanathan: Multirate Systems and Filter Banks (Prentice Hall, 1992).

2.2 Additional Readings

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

1.	A.N. Akansu et. al.: Multiresolution Signal Decomposition (2^{nd} edition, Academic Press, 2001).
2	T.B. Welch: Real-Time Digital Signal Processing from Matlab to C with the TMS320C6x DSK (CRC, 2005).
3.	P.Embree: Real-Time Digital Signal Processing from Matlab to C with the TMS320C6x DSK (Prentice Hall PTR; US Ed edition May 27, 1995).