City University of Hong Kong

Information on a Course offered by Department of _Electronic Engineering with effect from Semester __A__ in 2014/2015

This form is for completion by the *Course Co-ordinator/Examiner.* The information provided on this form will be deemed to be the official record of the details of the course. It has multipurpose use: for the University's database, and for publishing in various University publications including the Blackboard, and documents for students and others as necessary.

Please refer to the *Explanatory Notes* attached to this Form on the various items of information required.

Part I

Course Title:	Digital Signal Processing
Course Code:	EE4015
Course Duration:	One Semester (13 Weeks)
No. of credits:	3
Level:	B4
Medium of Instruction:	English
Prerequisites *(Course Code and Title)*:	EE3118 Linear Systems and Signal Analysis or EE3210 Signals and Systems
Precursors *(Course Code and Title)*:	Nil
Equivalent Course *(Course Code and Title)* :	EE3202 Digital Signal Processing, or EE4219 Digital Signal Processing
Exclusive Courses: *(Course Code and Title)*:	Nil

Part II

1. Course Aims:

The aim of this course is to provide students with a good foundation and understanding of digital signal processing theories and techniques for analysis and design and to use them in different areas of applications.

2. Course Intended Learning Outcomes (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)

Upon successful completion of this course, students should be able to:

No.	CILOs
1.	Identify and analyze discrete time signals and systems.
2.	Process analogue signals with digital signal processing.
3.	Implement FIR and IIR digital filters.
4.	Design FIR and IIR filters.

3. Teaching and Learning Activities (TLAs)

CILO 1-4	Teaching activities are primarily based on lectures followed by practical examples to allow students to relate theory with practice. Concepts and ideas will be reinforced through small group discussion, in-class exercise and demonstration

Timetabling Information

Pattern	Hours
Lecture:	39
Tutorials	0
Laboratory:	0
Other activities:	0

4. Assessment Tasks/Activities

	Type of assessment tasks	*Weighting (if applicable)*
Continuous Assessment	Quizzes, tests, mini-project	40%
Examination	Written exam	60% 2 hours

Remark: To pass the course, students are required to achieve at least 35% in course work and 35% in the examination.

5. Grading of Student Achievement:

Letter Grade	Grade Point	Grade Definitions
A+ A A-	4.3 4.0 3.7	Excellent
B+ B B-	3.3 3.0 2.7	Good
C+ C C-	2.3 2.0 1.7	Adequate
D	1.0	Marginal
F	0.0	Failure

6. Constructive Alignment with Major Outcomes

MILO	How the course contribute to the specific MILO(s)
1	An ability to apply knowledge of mathematics, science and engineering.
3	An ability to design a system, component, or process that conforms to a given specification within realistic constraints.
5	An ability to identify, formulate and solve engineering problems.

Part III

Keyword Syllabus:

Review of signals and systems
Classification of signals and systems, difference equations, impulse response, convolution, frequency response, discrete-time Fourier transform.

z-transform
Region of convergence, properties of z-transform, inverse z-transform, relation to discrete-time Fourier transform, transfer function, poles and zeros, relation to frequency response.

Digitization of analogue signals
Sampling of analogue signals, sampling theorem, aliasing and prefiltering, analogue-to-digital conversion, uniform and non-uniform quantization, analysis of quantization error, reconstruction of analogue outputs, practical considerations of ADC and DAC, digital processing of signals.

Digital filter design
Classification of digital filters, finite impulse response (FIR) and infinite impulse response (IIR) filters, realizations of FIR and IIR digital filters, direct forms, transposed structures, parallel structures, cascade structures, linear phase structures, finite word-length effects.

Properties of FIR filters, magnitude and phase responses, window design methods, frequency sampling design methods.

Properties of IIR filters, magnitude and phase responses, design of analogue filters, analogue to digital transformation, impulse invariant method, bilinear transformation, pre-warping, frequency transformation.

Discrete Fourier Transform
Discrete Fourier Series, Discrete Fourier Transform of finite duration sequences, Fast Fourier Transform, circular convolution, linear convolution and circular convolution, overlap-add and overlap-save methods, computations of convolution and correlation.

Applications of DSP in Communications
Transmultiplexing, echo cancellation, equalization, adaptive echo canceller, adaptive equalizer.

Recommended Reading:

Textbook:

Edmund M-K Lai, An Introduction to Digital Signal Processing, McGraw-Hill, 2004

H.C.So, Digital Signal Processing: Foundations, Transforms and Filters, with Hands-on MATLAB Illustrations, McGraw Hill, 2011

Reference Book:

Mitra, Sanjit K., Digital Signal Processing: A Computer-Based Approach, Third Edition, McGraw-Hill, 2006

Proakis J G and Manolakis D G, Digital Signal Processing: Principles, Algorithms, and Applications, Fourth edition, Prentice Hall, 2007.

Oppenheim, A. V., Schafer, R. W., and Buck, J. R., Discrete-time Signal Processing, Second Edition, Prentice Hall, 1999.

Online Resources (if any)

Returned by:

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