EE3210
Signals and Systems

Department of Electrical Engineering
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Syllabus Outline

- Signals and Systems in Time Domain
  Overview of Signals and Systems, Continuous-Time and Discrete-Time Signals, System Classification, Linear Time-Invariant System (LTI) Properties

- Signals and Systems in Frequency Domain
  Signal Representation using Fourier Series, Fourier Transform and discrete-time Fourier Transform, and their Properties, LTI System in Frequency Domain

- Analysis of Signals and Systems
  Conversion between Continuous-Time and Discrete-Time Signals, Analysis of LTI Systems using z-Transform and Laplace Transform

Intended Learning Outcomes

You will learn what is "Signals and Systems", why it is important, and how it can be applied.

On completion of this course, you will be able to

- Classify continuous-time and discrete-time signals and systems as well as understand their properties.
- Perform operations and transforms for signals and systems in different domains including time and frequency domains.
- Analyze signals and systems, and calculate LTI system input/output/responses using time-domain and transform methods.

Teaching Pattern

Date	LI 6606	Remark
2 Sep.	Lecture 1	
9 Sep.	Lecture 2	
16 Sep.	Lecture 3	Assignment 1 Due
23 Sep.	Lecture 4	MATLAB Exercise 1 Due
30 Sep.	Lecture 5	Assignment 2 Due
~~7 Oct.~~		
14 Oct.	Lecture 6	Test 1
21 Oct.	Lecture 7	
28 Oct.	Lecture 8	Assignment 3 Due
4 Nov.	Lecture 9	MATLAB Exercise 2 Due
11 Nov.	Lecture 10	Assignment 4 Due
18 Nov.	Lecture 11	Test 2
25 Nov.	Lecture 12	

Assessment

Coursework: 60%

- 4 Assignments: 12%
- 2 MATLAB Exercises: 8%
- 2 Tests: 40%

Examination: 40%

To pass the course, at least 30% of coursework AND examination marks are required. All tests and examination are open book format.

Act of academic dishonesty (e.g., plagiarism, submission for assessment of material that is not your own work) will be liable to disciplinary actions

https://www.cityu.edu.hk/pvdp/ah/ah-rules.htm

Book List

References:

1. A. V. Oppenheim and A. S. Willsky, ***Signals & Systems***, 2nd Edition, Prentice Hall, 1997
2. S. Haykin and B. Van Veen, ***Signals and Systems***, 2nd Edition, Wiley, 2005
3. M. N. O. Sadiku and W. H. Ali, ***Signals and Systems: A Primer with MATLAB***, CRC Press, 2016
4. H. C. So, ***Digital Signal Processing: Foundations, Transforms and Filters, with Hands-on MATLAB Illustrations***, McGraw-Hill, 2010

Prerequisites

Basic knowledge in linear algebra and calculus, e.g.,

A vector is one-dimensional array of scalars, e.g.,

$$\begin{bmatrix} 3 & -1 & 4 & -6 & 2 \end{bmatrix} \in \mathbb{R}^{1\times 5}$$

For a complex number $a+jb$, $j=\sqrt{-1}$, its magnitude and phase are $|a+jb|=\sqrt{a^2+b^2}$ and $\angle(a+jb)=\tan^{-1}(b/a)$

Euler formulas: $\cos(x)=\dfrac{e^{jx}+e^{-jx}}{2}$, $\sin(x)=\dfrac{e^{jx}-e^{-jx}}{2j}$

$$\frac{d(3x^n+2x+1)}{dx}=n\times 3x^{n-1}+2x^{1-1}=3nx^{n-1}+2$$

$$\int_{-T}^{T} e^{-jkt}dt=-\frac{1}{jk}e^{-jkt}\Big|_{-T}^{T}=-\frac{e^{-jkT}-e^{jkT}}{jk}=\frac{2\sin(kT)}{k}$$