

訊號處理與頻譜分析

Signal Processing and Spectral Analysis

課程安排

師生晤談	排定時間	地點	聯絡方式
	Wednesday 14:00 - 17:00	EB326	Ext:54919
週次	課程進度、內容、主題		
1	School's Anniversary Celebration		
2	Introduction; Continuous-Time Signals and Systems		
3	Class Suspension		
4	Sampling of Continuous-Time Signals		
5	Discrete-Time Signals and Systems		
6	Discrete-Time Linear Time-invariant System		
7	Fourier Transforms of Discrete-Time Signals (I)		
8	Spring Vacation		
9	Fourier Transforms of Discrete-Time Signals (II)		
10	Mid-term Exam		
11	The FFT and its Applications		
12	The Laplace Transform		
13	The z-Transform		
14	The Hilbert-Huang Transform		
15	Design of Digital Filter (I)		
16	Design of Digital Filter (II)		
17	Final Exam		
18	Optional		

- 以原文書為本課程之教課書
- 每週固定時間與有需要的同學交流
- 排定完整課程進度，讓學習循序漸進
- 安排兩次考試與作業，督促學習
- 因應疫情，隨時做好線上教學準備
- 聘請課堂助教協助解決學生問題
- 建立良好師生互動，活化上課氣氛

課堂講義

- 講義為全英文搭配相關圖片，不僅讓同學增進英文能力，圖片也能使同學更快理解
- 順應科技發展與電子產品逐漸普遍於校園，本課程提供紙本講義與雲端講義供同學自由選擇

Many human-made DT Signals

Ex.#1 Weekly Dow-Jones industrial average

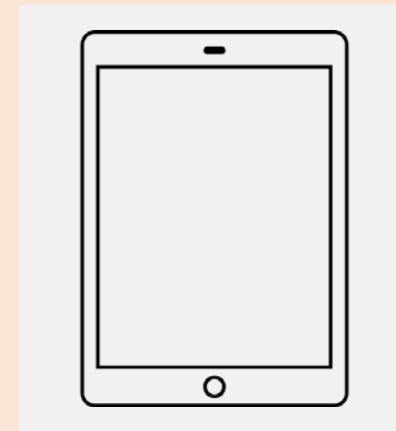
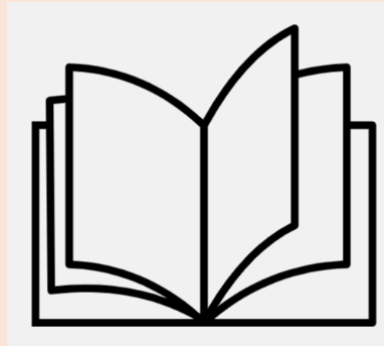


Ex.#2 digital image



Courtesy of Jason Oppenheim.
Used with permission.

Why DT? — Can be processed by modern digital computers and digital signal processors (DSPs).



課程教學特色

DIFFERENCE-EQUATION MODELS

- In this section, we consider difference-equation models for LTI DT system. Then, two methods are given for solving linear difference equations with constant coefficients; the first is a classical procedure and the second is an iterative procedure

- The general form of an Nth-order linear difference equation with constant coefficients is, with $a_0 \neq 0$

$$a_0 y[n] + a_1 y[n-1] + \dots + a_{N-1} y[n-N+1] + a_N y[n-N] = b_0 x[n] + b_1 x[n-1] + \dots + b_{M-1} x[n-M+1] + b_M x[n-M]$$

$a_0, \dots, a_N, b_0, \dots, b_M$ are constant. We consider only the case that these constants are real

- The general Nth-order equation can be expressed in a more compact form:

$$\sum_{k=0}^N a_k y[n-k] = \sum_{k=0}^M b_k x[n-k], \quad a_0 \neq 0$$

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Properties of Convolution and DT LTI Systems

A DT LTI System is completely characterized by its unit sample response

Ex. #1 : $h[n] = \delta[n-n_0]$

There are *many* systems with this response to $\delta[n]$

There is only one LTI Systems with this response to $\delta[n]$

shifted No step

$$y[n] = x[n-n_0]$$

unit sample response

$$x[n] * \delta[n-n_0] = x[n-n_0]$$

unit impulse response

$n < n-k$

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- 以95%英文搭配5%中文進行授課
- 分享實務經驗，讓教學活潑不死板
- 捨棄黑板教學，用平板搭配手寫幫助同學吸收、理解
- 善用雲端儲存技術，將上課筆記與作業上傳至雲端
- 同學若上課有疑問可於下課與老師討論，建立良好師生互動

03月 17日,11:39

03/16 上課講義 Discrete-Time Signals and Systems
03/16 上課講義...(看更多)

03月 17日,11:38

03/16 上課講義 Sampling of Continuous-Time Signals
03/16 上課講義...(看更多)

03月 9日,13:26

03/09 上課講義 Sampling of Continuous-Time Signals
03/09 上課講義...(看更多)

03月 9日,13:26

03/09 上課講義 Continuous-Time Signals and Systems
03/09 上課講義...(看更多)

04月 14日,12:36

4/13 上課講義 Discrete-Time Linear Time-invariant System
4/13 上課講義...(看更多)

03月 31日,12:25

3/30 上課講義 Discrete-Time Linear Time-invariant System
3/30 上課講義...(看更多)

03月 28日,17:01

03/30 Fourier Transforms of Discrete-Time Signals (I)
03/30 ... (看更多)

03月 28日,14:25

Quiz1