

通訊所專業必修/必選修課程綱要表

課程名稱：(中文) 數位訊號處理		開課學程	通訊所
(英文) Digital Signal Processing		課程代碼	COM5210
授課教師：林嘉文			
學分數	3	必/選修	選修
		開課年級	碩士班、博士班
先修科目或先備能力：			
課程概述與目標：This course introduces the concept and applications of digital signal processing. Several aspects including sampling and aliasing, discrete-time Fourier transform, z-Transform, FIR/IIR filter design, and DSP algorithms will be covered in this course.			
教科書 <sup>1</sup>	Alan V. Oppenheim and Ronald W. Schaffer, Discrete-Time Signal Processing, 3rd Ed., Person Prentice Hall, 2010.		
參考書目			
對應之學生核心能力		核心能力達成指標	比例(%)
1. 發掘、分析、解決問題與獨立研究之能力		A. 具備發掘問題之能力 B. 具備分析問題之能力 C. 具備解決問題之能力 D. 具備獨立研究之能力	70%
2. 通訊科技整合與創新之能力		A. 具備整合通訊知識之能力 B. 具備創新通訊科技知識之能力	5%
3. 學習新知識與技術之能力		A. 具備主動學習新知識之能力 B. 具備學習新技術之能力	20%
4. 良好溝通、表達與外語能力		A. 具備與通訊專業人員溝通與表達專業知識之能力 B. 具備外語專業能力用以溝通通訊專業知識	0%
5. 具團隊精神及遵守專業倫理		A. 具備團隊合作之能力與精神 B. 能遵守專業倫理	5%
課程綱要	內容綱要		核心能力達成指標 (請勾選)
Signal Processing Fundamentals	1. Overview of DSP 2. Applications of DSP		1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Discrete-Time Signals and Systems	1. Discrete Signals 2. Discrete-Time Systems 3. LTI Systems 4. Linear Constant-Coefficient Difference		1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B

	Equations 5. Frequency-Doman Representation 6. Fourier Transforms	5- <input type="checkbox"/> A <input type="checkbox"/> B
z-Transform	1. The z-Transform 2. Region of Convergence of the z-Transform 3. The Inverse z-Transform 4. Z-Transforms & LTI systems	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Sampling	1. Periodic Sampling 2. Frequency-Domain Representation of Sampling 3. Reconstruction of a Bandlimited Signal 4. Discrete-Time processing of Continuous-Time Signals 5. Continuous-Time processing of Discrete-Time Signals 6. Multirate Signal processing	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Transform analysis of LTI systems	1. Frequency Response of LTI Systems 2. Frequency Response for Rational Systems Functions 3. All-Pass Systems 4. Minimum-Phase Systems 5. Linear-Phase Systems	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Digital filter structures	1. Block Diagram Representation 2. Signal Flow Representation 3. Basic structures for IIR Systems 4. Basic Network Structure for FIR Systems 5. Lattice Filters 6. The Effects of Quantization	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Filter Design Techniques: IIR & FIR	1. Filter Specification 2. Design of Discrete-Time IIR Filters 3. Frequency Transformations of Lowpass IIR Filters 4. Design of FIR Filters by Windowing 5. Optimum Approximations of FIR Filters	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Discrete Fourier Transform (DFT)	1. The Discrete Fourier Series 2. The Fourier Transform of Periodic Signals 3. Sampling the Fourier Transform 4. The DFT 5. Linear Filtering Using the DFT	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B

Computation of DFT	1. Direct Computation of the DFT 2. Decimation-in-Time FFT 3. Decimation-in-Frequency FFT 4. More General FFT 5. Implementation of the DFT Using Convolution	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input type="checkbox"/> D 2- <input type="checkbox"/> A <input type="checkbox"/> B 3- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input type="checkbox"/> B
Computer Assignments	Perform computer simulations on digital filter design and analysis and submit written reports	1- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B <input checked="" type="checkbox"/> C <input checked="" type="checkbox"/> D 2- <input checked="" type="checkbox"/> A <input checked="" type="checkbox"/> B 3- <input type="checkbox"/> A <input type="checkbox"/> B 4- <input type="checkbox"/> A <input type="checkbox"/> B 5- <input type="checkbox"/> A <input checked="" type="checkbox"/> B

教學要點概述<sup>2</sup>：

教學方式(Teaching Method)

This course will be taught mostly by the lecturer using slides. Lecture notes will be made available on the course webpage before each class. In-class questions and answers, homework (computer assignments), and examinations will be used to help the students to understand the course contents.

成績考核(Evaluation)

Homework (15%)

10~15-min Quiz (one quiz per chapter) (15%)

Midterm & Final Exams (3 times) (70%)

可連結之網頁位址 <http://lms.nthu.edu.tw/>

註：1. 教科書請註明書名、作者、出版社、出版年等資訊。

2. 教學要點概述請填寫教材編選、教學方法、評量方法、教學資源、教學相關配合事項等。

3. 研究所所有開設之課程皆須填寫此表格或提供原有格式之課程綱要表，並呈現於實地訪評現場。