通訊所專業必修/必選修課程綱要表

課程名稱：（中文）通訊理論				開課學程	通訊所
（英文）Communication Theory				課程代碼	COM5120

授課教師：吳仁銘

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：機率、線性代數、訊號與系統、及基本通訊原理

課程概述與目標：This course covers the fundamental theories of digital communication systems. The focus will be on the mathematical modeling of the communication systems and the analysis of the system performance. The core concepts are: Signal Representation; Spectral Analysis; Optimal Receiver for Coherent and Non-Coherent systems; Probability of Error Analysis; Introduction to Information Theory; Bandlimited Channels; InterSymbol Interference (ISI), Equalizers, Channel Capacity, Multicarrier OFDM, and MIMO Communications.

教科書[1]	John G. Proakis and Masoud Salehi, "Digital Communications", 5th Ed., McGraw-Hill, 2008.
參考書目	1. D. Tse and P. Viswanath, "Fundamentals of Wireless Communication," 1st Ed., Cambridge University Press, 2005. 2. R. G. Gallager, "Principles of Digital Communication," 1st Ed., Cambridge University Press, 2008. 3. 3.Sergio Benedetto and Ezio Biglieri "Principles of Digital Transmission with wireless applications" Kluwer Academic/Plenum Publishers

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	20%
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	20%
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	40%
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	10%
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	10%

課程綱要	內容綱要	核心能力達成指標（請勾選）
1. Communication	1. Signal Space Representation of Waveforms	1-■A■B■C■D

Systems and Stochastic Process	2. Random Variables	2-■A■B
	3. Bounds on Tail Probabilities	3-■A■B
	4. Complex Random Variables	4-■A■B
	5. Series Expansion of Random Process	5-□A■B
2. Digital modulations		1-■A■B■C□D
	1. Memoryless Modulation Scheme	2-■A■B
	2. Modulation Scheme with Memory	3-■A■B
	3. Power Spectrum of Modulated Signals	4-■A■B
		5-□A■B
3. Optimum Receivers and AWGN Channels	1. Waveform and Vector AWGN Channels	
	2. Optimal Detection and Error Probability for Band-Limited Signaling	1-■A■B■C□D
	3. Optimal Detection in Presence of Uncertainty	2-■A■B
	4. Detection of Modulation Scheme with Memory	3-■A■B
	5. Optimal Receiver for CPM Signals	4-■A■B
		5-□A■B
4. Introduction to Information Theory	1. Measure of Information	1-■A■B■C□D
	2. Channel Models and Channel Capacity	2-■A■B
	3. Achieving Channel Capacity with Orthogonal Signals	3-■A■B
		4-■A■B
		5-□A■B
5. Digital Communication Through Bandlimited Channels and Inter-Symbol Interference	1. Design of Bandlimited Signals for No Inter-Symbol Interference	1-■A■B■C□D
	2. Design of Bandlimited Signals with Controlled Inter-Symbol Interference	2-■A■B
	3. Data Detection for Controlled ISI	3-■A■B
	4. Signal Design for Channels with Distortion	4-■A■B
		5-□A■B
6. Optimum Receiver for Channels with ISI and AWGN	1. Optimum Maximum-Likelihood Receiver	1-■A■B■C□D
	2. Discrete Time Model for a Channel with ISI	2-■A■B
	3. Maximum-Likelihood Sequence Detector for Discrete Time White Noise Filter Model	3-■A■B
		4-■A■B
		5-□A■B
7. Linear Equalization	1. Peak Distortion Criterion	1-■A■B■C□D
	2. Mean Square Error Criterion,	2-■A■B
	3. Decision Feedback Equalization	3-■A■B
		4-■A■B
		5-□A■B
8. Multichannel and multicarrier Systems	1. Multichannel Digital Communications in AWGN Channels	1-■A■B■C□D
		2-■A■B
	2. Single Carrier and Multicarrier	3-■A■B

	Communications 3. Orthogonal Frequency Division Multiplexing (OFDM) 3.　Modulation and Demodulation in the OFDM System 4.　FFT Implementation of OFDM System	4-■A■B 5-□A■B

教學要點概述[2]：

1. 教材編選：本課程之教材主要根據指定教科書編撰
2. 教學方法：課堂講解
3. 評量方法：作業：20%
　　　　　　期中考一：25%
　　　　　　期中考二：25%
　　　　　　期末考：30%
4. 教學資源：

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。