City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester A in 2020/2021

Part I Course Overview

Course Title:	Principles of Communications
Course Code:	EE3008
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	B3
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	MA2001 Multi-variable Calculus and Linear Algebra
Precursors: *(Course Code and Title)*	Nil
Co-requisites *(Course Code and Title)*:	EE3210 Signals and Systems
Equivalent Courses: *(Course Code and Title)*	EE4940
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

The course aims to introduce the principles of point-to-point communication. The objective is intended for the students to understand various modulation schemes for analogue- and digital-signal transmission, and to analyse their performance in terms of signal-to-noise ratio, bandwidth requirement, and error performance.

2. Course Intended Learning Outcomes (CILOs)

(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.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Evaluate analogue AM systems in both the time and frequency domains.		√	√	
2.	Describe the FM system in terms of its working principle and implementation. Evaluate a single-tone FM signal in terms of its spectrum lines, bandwidth, and modulation index.		√	√	
3.	Explain the working principle of PCM and PAM systems in analogue-to-digital signal conversion, and evaluate their performance in terms of quantization level to SQNR, signal bandwidth, and system data rate.		√	√	
4.	Evaluate coherent BPSK, BFSK and QPSK schemes in terms of signal constellation, system bandwidth, and bit error performance.		√	√	
5.	Identify different types of transmission media.		√	√	
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5		
Lecture and	Key concepts are described and illustrated	√	√	√	√	√		2 hrs/wk
Tutorials	Key concepts are worked out based on problems	√	√	√	√	√		1 hrs/wk

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3	4	5			
Continuous Assessment: 50%								
Tests (min.: 2)	✓	✓	✓	✓	✓		40%	
#Assignments (min.: 3)	✓	✓	✓	✓	✓		10%	
Examination: 50% (duration: 2 hrs , if applicable)								
Examination	✓	✓	✓	✓	✓		50%	
** The weightings should add up to 100%.*							100%	

Remark:

To pass the course, students are required to achieve at least 30% in course work and 30% in the examination.

may include homework, tutorial exercise, project/mini-project, presentation

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair(C+, C, C-)	Marginal (D)	Failure (F)
1. Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels

6. Constructive Alignment with Major Outcomes

MILO No.	How the course contribute to the specific MILO(s)
1	An ability to apply knowledge of mathematics, science and engineering.
2	An ability to design and conduct experiments as well as to analyze and interpret data.
5	An ability to identify, evaluate, formulate and solve engineering problems.
8	Knowledge in contemporary issues and an awareness of the impact of engineering solutions in a broad, global and societal context.
10	An ability to use necessary engineering tools.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

Spectrum Analysis
Fourier transform; bandwidth requirement; basic frequency properties of digital signals.

Digital Baseband Transmission for Analogue Signal
Formatting analogue information : sampling process, aliasing; pulse amplitude modulation and time division multiplexing; waveform representation of binary digits; Amplitude quantization : quantization noise, uniform and non-uniform quantizing; pulse code modulation (PCM), μ-law companding; Differential PCM.

Analog Modulation-AM
Amplitude modulation (AM) : generation and detection, signal to noise ratio; modulation index; spectral analysis; system bandwidth requirement; single-sideband modulation.

Analog Modulation-FM
Frequency Modulation (FM) : narrowband and wideband FM, FM signal generation; spectral analysis of single-tone FM signals; average power and bandwidth; FM receivers.

Digital Modulation/Demodulation
Phase shift keying, frequency shift keying: generation, differential encoding, coherent & non-coherent detection, error performance in an additive Gaussian channel, bandwidth requirement.

Transmission Media
Metallic cable: data rate and bandwidth limitation;
Optical fibre: light propagation, optical sources and detectors;
Satellite: orbit & subsystems, multiple access techniques;
Wireless Network: cellular phone, wireless LAN.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	N/A

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	H. Stern and S. Mahmoud, Communication Systems Analysis and Design, (Pearson Prentice Hall 2004)
2.	S Haykin: Communication Systems, (John Wiley & Sons, 4th Edition, 2001)
3.	F G Stremler: Introduction to Communication Systems, (Addison-Wesley, 3rd Edition, 1990)
4.	B Sklar: Digital Communications, Fundamentals and Applications, (Prentice-Hall, 2nd edition 2001)