City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester <u>B in 2023/2024</u>

Part I Course Overview

Course Title:	Wireless Communication Technologies
Course Code:	EE6603
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	EE3008 Principles of Communications
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. **Abstract**

This course aims to provide students with an understanding of the principles of wireless communication theory, with emphasis on problem-solving techniques via discovery learning, leading to the solutions of signal and system design problems of practical wireless communication networks such as cellular networks and WiFi networks.

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.	Describe the characteristics of fading channels and recognize the statistical modelling approach of wireless channels.		✓		
2.	Apply the diversity techniques to overcome fading.		✓	✓	
3.	Explain multiple access techniques and their application in practical wireless systems.		✓	✓	✓
4.	Understand the requirements and evaluation methods and apply to practical wireless systems.		✓	✓	✓
		100%			

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			
Lecture	Key concepts of wireless communication theory are described and illustrated.	✓	✓	✓	✓			2 hrs/wk
Tutorials	Questions are sent out for the students to better understand the key concepts.	✓	✓	✓	✓			1 hr/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				
Continuous Assessment: 60%								
Tests (min.: 2)	✓	✓	✓	✓			36%	
#Assignments (min.: 3)	✓	✓	✓	✓			24%	
Examination: 40% (duration: 2 hrs , if applicable)								
Examination	✓	✓	✓	✓			40%	
							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.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B,)	Marginal (B-, C+, C)	Failure (F)
1. Examination	Achievements in CILOs	High	Medium	Low	Not even reaching marginal level
2. Coursework	Achievements in CILOs	High	Medium	Low	Not even reaching marginal level

Applicable to students admitted before Semester A 2022/23

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 level
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level

6.   **Constructive Alignment with Programme Outcomes**

PILO	How the course contribute to the specific PILO(s)
1, 2, 3,4	The course provides students with amble opportunities in acquiring knowledge of and evaluation of new wireless communication technologies, and also the applications of mathematics and engineering problem solving skills which are central to the aims of this program. Students are encouraged to develop the ability to integrate their learning into a real-world design in wireless communications.

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

1.   **Keyword Syllabus**

Wireless channel
Fading, path loss, shadowing, flat fading, frequency-selective fading, slow fading, fast fading, delay spread, Doppler spread, coherence bandwidth, coherence time.

Diversity
Time diversity, coding, interleaving, frequency diversity, time-domain equalization, OFDM, CDMA, rake receiver, space diversity, transmit diversity, receive diversity, space-time coding, beamforming.

Centralized Multiple Access
CDMA, OFDMA, TDMA, Scheduling, Cellular networks.

Random Access
Aloha, CSMA, WiFi networks.

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.	Andrea Goldsmith, *Wireless Communications*, Cambridge University Press, 2005.

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

1.	David Tse and Pramod Viswanath, *Fundamentals of Wireless Communication*, Cambridge University Press, 2005.
2.	Andreas F. Molisch, *Wireless Communications*, John Wiley & Sons Ltd, 2005.
3.	Dimitri Bertsekas and Robert Gallager, *Data Networks* (2nd Edition), Prentice Hall, 1992.
4.	Robert G. Gallager, *Principles of Digital Communication*, Cambridge University Press, 2008.
5.	John G. Proakis and Masoud Salehi, *Digital Communications* (5th Edition), McGraw Hill, 2005.
6.	B. Sklar, *Digital Communications: Fundamentals and Applications* (2nd Edition), Prentice-Hall, 2001.