

City University of Hong Kong
Course Syllabus

offered by Department of Electronic Engineering
with effect from Semester B in 2017/2018

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
Course project	Students are encouraged to form a team and choose an advanced topic in the area of wireless communications as their course project, and present his/her findings and ideas in class. Comments on their presentations will be provided so that they could better prepare for the final project reports.			✓	✓			

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: <u>40%</u>								
At least 3 assignments (course project etc.)			✓	✓			40%	
Examination: <u>60%</u> (duration: 2hrs)								
							100%	

Remark:

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

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 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	The course provides students with ample 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.
4, 5	Students are required to complete a course project to gain practical experience in wireless communication system design and reflect on how to apply what they have learned in this course to solve practical problems. The analytical and research skills developed are central to the aims of this program.

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.

Students are required to choose an advanced topic in wireless communications as their course projects; topics include (but not limited to):

1. A comparative study of WiFi and LiFi
2. Recent updates on wireless PAN
3. Opportunities and challenges of C-RAN
4. Resource allocation for D2D networks
5. Millimeter wave communications for 5G networks
6. Massive MIMO for 5G networks
7. Energy harvesting for cellular systems
8. Physical layer security for wireless 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.	David Tse and Pramod Viswanath, <i>Fundamentals of Wireless Communication</i> , Cambridge University Press, 2005.

2.2 Additional Readings

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

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