

**City University of Hong Kong**  
**Course Syllabus**

**offered by College/School/Department of Electrical Engineering**  
**with effect from Semester B in 2019/2020**

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**Part I Course Overview**

**Course Title:** Wireless Communications

**Course Code:** EE4036

**Course Duration:** One Semester (13 weeks)

**Credit Units:** 3

**Level:** B4

**Proposed Area:**  Arts and Humanities  
*(for GE courses only)*  Study of Societies, Social and Business Organisations  
 Science and Technology

**Medium of Instruction:** English

**Medium of Assessment:** English

**Prerequisites:** EE3008 Principle of Communications  
*(Course Code and Title)*

**Precursors:** Nil  
*(Course Code and Title)*

**Equivalent Courses:** Nil  
*(Course Code and Title)*

**Exclusive Courses:** Nil  
*(Course Code and Title)*

## Part II Course Details

### 1. Abstract

The course aims to provide students with an understanding of the concepts/techniques/basic principles and the most update knowledge in wireless communications.

### 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 <sup>#</sup>	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	analyze and apply the appropriate wave propagation for microwave communication		✓	✓	
2.	understand basics of satellite communication and the related link budget design		✓	✓	
3.	acquire the basic knowledge of antenna, <u>Diversity, path loss and Link analysis</u>		✓	✓	
4.	Understand the basics of mobile telephony, network planning and traffics of mobile telephony systems		✓	✓	
5.	understand the basics of most update wireless systems		✓	✓	
		100%			

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

<sup>#</sup> 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	
Lectures/tutorial	Concepts/techniques/basic principles and the most update knowledge in wireless communications are described, illustrated, analysed and explained	✓	✓	✓	✓	✓	3 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: <u>65 %</u>							
Tests (min: 2)	✓	✓	✓	✓	✓	40%	
#Assignments (min: 3)	✓	✓	✓	✓	✓	25%	
Examination: <u>35%</u> (duration: 2hrs )							
Examination	✓	✓	✓	✓	✓	35%	
						100%	

#### Remark:

To pass the course, students are required to achieve at least 30% in the continuous assessment 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	Achieving all CILOs	High	Significant	Moderate	Margin	Not even reaching marginal
2. Coursework	Achieving all CILOs	High	Significant	Moderate	Margin	Not even reaching marginal

## 6. Constructive Alignment with Major Outcomes

Please state how the course contribute to the specific MILO(s)

MILO	How the course contribute to the specific MILO(s)
1	Introduce various factors which affect the reliability of the wireless communication and their solutions
3	Discussed antenna basics and mobile & wireless system planning-
5	Introduce mathematical model to formulate the radio wave propagation, link budget

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

#### 1. Keyword Syllabus

##### Characteristics of Radio Wave Propagation

Attenuation and absorption; interference and noise; ground wave propagation; line-of-sight space wave propagation and effective earth radius; ionospheric propagation and critical frequency; tropospheric scatter propagation.

##### Satellite Communication Systems

Geostationary and non-geostationary orbits; global beam and spot beam; spectrum management; international satellite systems; transponders; multiple access techniques; intermodulation distortion and backoff; VSAT; link budget.

##### Antennas, Diversity, and Link analysis

Basics and characteristics of antennas; Mobile radio propagation large-scale path loss, modulation technique; multi-path fading; frequency diversity; space diversity; link calculation.

##### Mobile Communications

Cellular mobile phones: basic network structure; multiple access techniques; frequency reuse; capacity of cellular networks; signal to interference ratio; channel allocation techniques; location management; hand-off management; quality of service(QoS)

##### Other Wireless Communications

Internet of Things, ZigBee, Thread, Lora, Sig Fox, Narrowband IoT, DECT, Tetra, WiMax, WiFi, LTE etc.

## 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.	D K Cheng: <u>Field and Wave Electromagnetics</u> , (2nd Edition, John Wiley, 1989)
2.	Kim-fung Tsang: " <u>Wireless Communication</u> ", (Pearson 2007).
3.	Kim-fung Tsang: " <u>ZigBee: From Basics to Designs and Applications</u> ", (Pearson 2008)

### 2.2 Additional Readings

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

1.	KF Tsang et al: <u>LTE and the Evolution to 4G Wireless: Design and Measurement Challenges</u> , (Agilent Technologies 2009)
2.	W Tomasi: <u>Advanced Electronic Communication Systems</u> , (5th Edition, Prentice Hall, 2001)
3.	Vijay K Carg and Joseph E Wilkes: <u>Wireless and Personal Communications Systems</u> , (Prentice Hall, 1996)
4.	J Dunlop and D G Smith: <u>Telecommunications Engineering</u> , (Chapman and Hall, 3rd Edition, 1994)
5.	A A R Townsend: <u>Digital Line-Of-Sight Radio Links</u> , (Prentice Hall, 1988)
6.	S M Redl, M K Weber, and M W Oliphant: <u>An Introduction to GSM</u> , (Artech House, 1995)
7.	T S Rappaport: <u>Wireless Communications, Principles and Practice</u> , (Prentice Hall, 1996)