

**City University of Hong Kong  
Course Syllabus**

**offered by Department of Electrical Engineering  
with effect from Semester B in 2022/2023**

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**Part I Course Overview**

<b>Course Title:</b>	Mobile Communication and Networks
<b>Course Code:</b>	EE6453
<b>Course Duration:</b>	One Semester (13 weeks)
<b>Credit Units:</b>	3
<b>Level:</b>	P6
<b>Medium of Instruction:</b>	English
<b>Medium of Assessment:</b>	English
<b>Prerequisites:</b> <i>(Course Code and Title)</i>	Nil
<b>Precursors:</b> <i>(Course Code and Title)</i>	EE3008 Principles of Communications; or equivalent
<b>Equivalent Courses:</b> <i>(Course Code and Title)</i>	Nil
<b>Exclusive Courses:</b> <i>(Course Code and Title)</i>	Nil

## Part II Course Details

### 1. Abstract

The course aims to provide students with theoretical and technical knowledge in cellular mobile 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	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Evaluate and characterize the large-scale and small-scale propagation behaviour of wireless channels using empirical and statistical models, and apply effective techniques to combat multi-path fading.			✓	
2.	Analyze frequency reuse principles for the 1 <sup>st</sup> generation cellular systems.			✓	
3.	Analyze coding and modulation techniques for the 2 <sup>nd</sup> generation cellular systems.			✓	
4.	Analyze CDMA technology for the 3 <sup>rd</sup> generation cellular systems.			✓	
5.	Analyze OFDM technology for the 4 <sup>th</sup> generation cellular systems.			✓	
6.	Comment on new technology for future cellular 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 CIOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5	6	
Lecture	Knowledge of the general concepts mobile communication systems and networks.	✓	✓	✓	✓	✓	✓	3 hrs/wk (Some of the lecture hours will be used for tutorials)

### 4. Assessment Tasks/Activities (ATs)

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

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4	5	6		
Continuous Assessment: 50 %								
Tests (min.: 2)	✓	✓	✓	✓	✓	✓	50%	
#Assignments (min.: 3)	✓	✓	✓	✓	✓	✓		
Examination: 50 % (duration: 2hrs , if applicable)								
Examination	✓	✓	✓	✓	✓	✓	50 %	
							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, 4,5,6	This course provides students with knowledge and various techniques for mobile communications. Students are encouraged to develop the ability to integrate their learning of the course into a real-world design in mobile communication systems and networks.

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

#### 1. Keyword Syllabus

Signal propagation and mobile channels: Fast fading and slow fading; flat fading and frequency-selective fading; vehicle motion and Doppler frequency shift; coherence bandwidth and coherence time.

Cellular systems: Frequency reuse; reuse pattern; system capacity; channel assignment; signal to co-channel interference ratio; power control and handoff..

Modulation and coding techniques: Brief description of GSM; convolutional codes and turbo codes; generation polynomials; shift registers encoder; trellis diagram and Viterbi decoder; free distance and correction capability; Soft-in soft-output decoder.

CDMA systems: Brief description of IS-95; spreading codes; PN sequences; processing gains; interleaving.

OFDM systems: Brief description of LTE; DFT and FFT; adaptive loading; cyclic pre-fix; peak-to-average-power ratio; time-frequency resource.

Multiple antenna techniques: Beam patterns to nullify co-channel interferers; maximal ratio combining; equal gain combining; selection combining; diversity gain; space-division multiple access (SDMA).

#### 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.
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##### 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 (2nd Edition)</i> , 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 (5th Edition)</i> , McGraw Hill, 2005.
6	B. Sklar, <i>Digital Communications: Fundamentals and Applications (2nd Edition)</i> , Prentice-Hall, 2001.