

EE6453: MOBILE COMMUNICATION AND NETWORKS

Effective Term

Semester B 2024/25

Part I Course Overview

Course Title

Mobile Communication and Networks

Subject Code

EE - Electrical Engineering

Course Number

6453

Academic Unit

Electrical Engineering (EE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

P5, P6 - Postgraduate Degree

R8 - Research Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

EE3008 Principles of Communications; or equivalent

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

The course aims to provide students with theoretical and technical knowledge in cellular mobile communications.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if app.)	DEC-A1	DEC-A2	DEC-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.			x	
2	Analyze frequency reuse principles for the 1st generation cellular systems.			x	
3	Analyze coding and modulation techniques for the 2nd generation cellular systems.			x	
4	Analyze CDMA technology for the 3rd generation cellular systems.			x	
5	Analyze OFDM technology for the 4th generation cellular systems.			x	
6	Comment on new technology for future cellular systems.		x		

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 real-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.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will be involved in lectures to gain knowledge about key concepts of mobile communication systems and networks.	1, 2, 3, 4, 5, 6	3 hrs/wk (Some of the lecture hours will be used for tutorials)

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests (min.: 2)	1, 2, 3, 4, 5, 6	40	
2	#Assignments (min.: 3)	1, 2, 3, 4, 5, 6	10	

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

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

Assessment Rubrics (AR)**Assessment Task**

Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Coursework (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B, B-) Significant

Fair

(C+, C, C-) Moderate

Marginal

(D) Basic

Failure

(F) Not even reaching marginal level

Assessment Task

Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B) Medium

Marginal

(B-, C+, C) Low

Failure

(F) Not even reaching marginal level

Assessment Task

Coursework (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

Achievements in CILOs

Excellent

(A+, A, A-) High

Good

(B+, B) Medium

Marginal

(B-, C+, C) Low

Failure

(F) Not even reaching marginal level

Additional Information for AR

Constructive Alignment with Programme Outcomes

PILO 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

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).

Reading List

Compulsory Readings

Title	
1	David Tse and Pramod Viswanath, Fundamentals of Wireless Communication Cambridge University Press, 2005.

Additional Readings

Title	
1	Andrea Goldsmith, Wireless Communications 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.