

EE4036: WIRELESS COMMUNICATIONS

Effective Term

Semester A 2022/23

Part I Course Overview

Course Title

Wireless Communications

Subject Code

EE - Electrical Engineering

Course Number

4036

Academic Unit

Electrical Engineering (EE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

EE3008 Principle of Communications

Precursors

Nil

Equivalent Courses

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

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

Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	analyze and apply the appropriate wave propagation for microwave communication	x	x	
2	understand basics of satellite communication and the related link budget design	x	x	
3	acquire the basic knowledge of antenna, Diversity, path loss and Link analysis	x	x	
4	Understand the basics of mobile telephony, network planning and traffics of mobile telephony systems	x	x	
5	understand the basics of most update wireless systems	x	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.

Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Concepts/techniques/basic principles and the most update knowledge in wireless communications are described, illustrated, analysed and explained	1, 2, 3, 4, 5 3 hrs/wk

Assessment Tasks / Activities (ATs)

ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests (min: 2)	1, 2, 3, 4, 5 40	
2	#Assignments (min: 3)	1, 2, 3, 4, 5 25	

Continuous Assessment (%)

65

Examination (%)

35

Examination Duration (Hours)

2

Additional Information for ATs

Remarks:

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

may include homework, tutorial exercise, project/mini-project, presentation

Assessment Rubrics (AR)

Assessment Task

Examination

Criterion

Achieving all CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Margin

Failure (F)

Not even reaching marginal

Assessment Task

Coursework

Criterion

Achieving all CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Margin

Failure (F)

Not even reaching marginal

Part III Other Information

Keyword SyllabusCharacteristics 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.

Reading List**Compulsory Readings**

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

Additional Readings

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