EE6619: ANTENNA DESIGN FOR WIRELESS COMMUNICATIONS

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Antenna Design for Wireless Communications

Subject Code
EE - Electrical Engineering
Course Number
6619

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
EE3109 Applied Electromagnetics

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

To provide students with electromagnetic field fundamentals and with basic theory in the designs of planar and printed antennas, including dipole, slot, microstrip patch and dielectric resonator antennas for modern wireless communications. Techniques for bandwidth enhancement, multi-band operation, and size reduction are studied.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	To learn the fundamentals of antenna design.		x		
2	To learn the design of dipole antenna and array.		x	x	
3	To learn the design of microstrip patch antenna and array.		x	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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	To learn antenna theory, measurement techniques, design techniques	1, 2, 3	3 hrs/wk(Some of the lectures will be conducted as in-class exercises, case studies, and mini-projects)
2	Self-study	To learn analysis and design	1, 2, 3	
3	Mini-project	To design, construct and test of a microstrip antenna for practical use	2, 3	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	One Test	1, 2, 3	25	-	No
2	5 Assignments	1, 2, 3	10	-	Yes
3	1 Mini-Project	1, 2, 3	15	-	Yes

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

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 The course provides students with knowledge on the development of printed antennas for modern wireless communications. Upon completion of the course, students will be able to design planar and printed antennas.

PILO 1 Students are required to complete assignments to gain experience in the analysis of basic wire antennas and arrays.

PILO 2, 3, 4 An individual mini-project is allocated to allow students to practice the design, fabrication and measurement of printed antennas for various wireless applications.

Part III Other Information

Keyword Syllabus

Fundamentals of antenna design and measurement
Hertzian dipole, transmitting antenna parameters, receiving antenna, far-field and near-field antenna measurement.
Wire antenna and array
Half-wave dipole, balun, folded dipole, loop antennas, array factor, pattern multiplication, uniform array, mutual coupling, scan blindness, feed network, switch-beam array, Yagi-Uda antenna.
Microstrip patch antenna
Basic characteristics, transmission line model, cavity model, feed techniques, bandwidth enhancement techniques, size reduction techniques, circularly polarized patch antenna, dual polarized patch antenna, patch antenna arrays.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Kai Fong Lee and Kwai Man Luk, Microstrip Patch Antennas Imperial College Press, 2011.
2	Eng Hock Lim and Kwok Wa Leung, Compact Multifunctional Antennas Wiley, 2012.
3	Warren L. Stutzman and Gary A. Thiele, Antenna Theory and Design Wiley, 1998.