EE8401: ADVANCED TOPICS IN APPLIED ELECTROMAGNETICS

Effective Term
Semester A 2026/27

Part I Course Overview

Course Title
Advanced Topics in Applied Electromagnetics

Subject Code
EE - Electrical Engineering
Course Number
8401

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
EE3109 Applied Electromagnetics or other related courses.

Equivalent Courses
EE5435 Advanced Topics in Applied Electromagnetics

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to provide new and developing areas of knowledge in applied electromagnetics to augment the existing curriculum. Depending on the topics, theoretical, experimental and/or computational aspects will be covered. Topics include, but not limited to, millimeter-wave and terahertz circuits and devices; millimeter-wave and terahertz antenna design, fabrication and measurement; terahertz science and technology; metamaterials and metasurfaces; computational electromagnetics; and electromagnetic compatibility.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe fundamental concepts in selected topics in applied electromagnetics		x		
2	Demonstrate practical skills on the selected topics in applied electromagnetics		x		
3	Describe the latest research trends in the selected topics in applied electromagnetics		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	Explain key concepts in the selected topics in applied electromagnetics	1, 2, 3	3 hrs/wk (Some of the lectures in the form of tutorials can be conducted in the laboratory.)
2	Mini-project (Optional)	Conduct projects on applied electromagnetics	1, 2, 3	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Tests (min.: 1)	1, 2	25	-	No
2	#Assignments (min.: 3)	1, 2, 3	15	-	Yes
3	Lab Exercises/ Reports	1, 2, 3	10	-	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. Also, 75% laboratory attendance rate must be obtained.
may include homework, tutorial exercise, project/mini-project, presentation

Assessment Rubrics (AR)

Assessment Task

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

Criterion

Describing basic antenna theory, antenna parameters, and EM radiation

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

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

Criterion

2.1 Describing the basic measurement techniques for antennas
2.2 Describing the essential factors and components in high-frequency measurements

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

Criterion
Ability to conduct antenna performance measurement, including frequency and time domain technologies for radiation measurement and analysis

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 before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
4.1 Ability to describe the principle and critical components of different antenna measurement setups, including near-field, far-field, frequency, and time domain measurements
4.2 Ability to describe the operating principle of different antennas, including parabolic, metasurface lens, horn, patch, slot and array

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

Criterion
Describing basic antenna theory, antenna parameters, and EM radiation

Excellent
(A+, A, A-) High

Good
(B+, B) Medium

Marginal
(B-, C+, C) Low

Failure
(F) Not even reaching marginal level

Assessment Task
Assignments (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
2.1 Describing the basic measurement techniques for antennas
2.2 Describing the essential factors and components in high-frequency measurements

Excellent
(A+, A, A-) High

Good
(B+, B) Medium

Marginal
(B-, C+, C) Low

Failure
(F) Not even reaching marginal level

Assessment Task
Lab Exercises/Reports (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to conduct antenna performance measurement, including frequency and time domain technologies for radiation measurement and analysis

Excellent
(A+, A, A-) High

Good
(B+, B) Medium

Marginal
(B-, C+, C) Low

Failure
(F) Not even reaching marginal level

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

Criterion
4.1 Ability to describe the principle and critical components of different antenna measurement setups, including near-field, far-field, frequency, and time domain measurements
4.2 Ability to describe the operating principle of different antennas, including parabolic, metasurface lens, horn, patch, slot and array

Excellent
(A+, A, A-) High

Good
(B+, B) Medium

Marginal
(B-, C+, C) Low

Failure
(F) Not even reaching marginal level

Part III Other Information

Keyword Syllabus
Latest developments on topics including, but not limited to, the following:
- Millimeter-wave and Terahertz Antennas, Circuits and Devices
- Antenna and Radiation Measurement Techniques from Microwave to Terahertz Bands
- High-Frequency Electromagnetic Devices Modeling and Computational Electromagnetics
- Metamaterials and Metasurfaces – Theory and Applications
- Millimeter-wave and Terahertz Detection and Imaging

Reading List

Compulsory Readings

	Title
1	Lecture notes tailored to cover the selected topics in the latest developments in applied electromagnetics
2	Books assigned for selected special topics

Additional Readings

	Title
1	Relevant journal papers for the selected special topics