

EE5435: 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

5435

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 or other related courses.

Equivalent Courses

EE8401 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 DEC-A1 DEC-A2 DEC-A3 app.)			
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

Additional Information for AR

Constructive Alignment with Programme Outcomes

PILO 1 - The student will acquire an ability to describe current and anticipated trends in applied electromagnetics through lectures, tutorials, assignments, and/or mini-projects.

PILO 2 - The student will be able to evaluate and analyze new technologies in applied electromagnetics through lectures, tutorials, assignments, and/or mini-projects.

PILO 3 - The student will be able to apply specialist knowledge in the topics in applied electromagnetics through the lectures, tutorials, assignments, and/or mini-projects.

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