City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester A 2023 / 2024

Part I Course Overview

Course Title:	Meta-device and Photonic System Analysis
Course Code:	EE5439
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	P5
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

The aim of the course is to provide students with theoretical knowledge, simulation modeling, and analytical skills necessary for an in-depth understanding of photonic system of optoelectronics and meta-devices. Major topics include antenna design, the interaction between electromagnetic waves and matter, and property analysis for nanostructures, meta-devices and photonic systems.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Explain the principles of electromagnetic waves and Fundamental concepts of meta-devices and photonic systems.		✓	✓	
2.	Apply photonic system analysis techniques to meta-devices and photonic systems.		✓	✓	
3.	Design and analyse meta-devices and photonic systems for specific functions and visualization of simulated results.		✓	✓	✓
4	Perform independent studies to identify the potential applications and innovations of meta-devices and advanced photonic systems.		✓	✓	✓
		100%			

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4			
Lecture and Tutorial	Knowledge of the general concepts in photonic systems and their applications; practice simulation modeling and analysis.	✓	✓	✓	✓			3 hrs/wk for 13 weeks

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4				
Continuous Assessment: 70 %								
Test (> 2 times)	✓	✓	✓	✓			30%	
Assignments (> 3 times)	✓	✓	✓	✓			20%	Includes homework, tutorial exercises, and in-class exercises.
Reports/Project		✓	✓	✓			20%	Includes reports, project, mini-project, and presentation.
Examination: 30 % (duration: 2 hrs)								
Examination	✓	✓	✓	✓			30%	
							100%	

Remark:

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

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B,)	Marginal (B-, C+, C)	Failure (F)
1. Examination	Achievements in CILOs	High	Medium	Low	Not even reaching marginal level
2. Coursework	Achievements in CILOs	High	Medium	Low	Not even reaching marginal level

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level

6. Constructive Alignment with Programme Outcomes

PILO	How the course contributes to the specific PILO(s)
1,2,3,4	Students are required to apply the fundamental theoretical knowledge and analytical skills for an in-depth understanding of meta-devices and photonic systems. The students will formulate and solve problems using the learnt knowledge and skills.
2,3,4,5	Students are required to complete an independent research study on new developments of meta-devices and photonic systems.
6	Students are required to give an oral presentation of their independent projects.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

- Fundamental concepts of photonics
- Basic principle of meta-devices
- Overview of photonic systems
- Design, fabrication, characterization and application of meta-devices
- General meta-device and photonic system analysis techniques
- Simulation modelling, parameters setting, and result verification
- Visualization and analysis of simulated results
- Case study: simulation of meta-devices and photonic systems

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Course notes provided by the instructor

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Roger W. Pryor, Multiphysics Modeling Using COMSOL 5 and MATLAB, 2022
2.	Layla S. Mayboudi, Geometry Creation and Import With COMSOL Multiphysics (Multiphysics Modeling Series), 2019.
3.	Slawomir Sujecki, Photonics Modeling and Design, 2014
4	Sophocles Orfanidis, Electromagnetic Waves and Antennas, 2016.
5.	Merhzad Tabatabaian, COMSOL5 for Engineers, 2015.
6.	Levent Sevgi, Electromagnetic Modeling and Simulation, 2014.