

Subject Description Form

Subject Code	EIE571
Subject Title	Photonic System Analysis
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	N/A
Objectives	<ol style="list-style-type: none"> 1. Understand the principles and techniques of photonic device and system analysis, simulation and modeling 2. Learn to obtain optical characteristics of photonic devices and systems through computer simulation.
Intended Learning Outcomes	<p>Upon completion of the subject, students will be able to:</p> <p><u>Category A: Professional/academic knowledge and skills</u></p> <ol style="list-style-type: none"> a. Understand how to analyze and design photonic devices and systems through modeling and simulation. b. Learn to use simulation methods to build up the database for the design of photonic devices and systems. <p><u>Category B: Attributes for all-roundedness</u></p> <ol style="list-style-type: none"> c. Communicate effectively. d. Think critically and creatively. e. Assimilate new technological development in the related field.
Subject Synopsis/ Indicative Syllabus	<ol style="list-style-type: none"> 1. Fundamental concepts <ol style="list-style-type: none"> 1-1. Basic concepts of optics 1-2. Polarization 1-3. Size versus light wavelength 1-4. Common photonic system analysis techniques 2. Photonic simulation <ol style="list-style-type: none"> 2-1. Simulation parameters 2-2. Create 2D/3D model of photonic simulation 2-3. Material import for photonic simulation 2-4. Boundary conditions 3. Meshing techniques <ol style="list-style-type: none"> 3-1. Mesh types 3-2. Boundary layer meshing 3-3. Automatic re-meshing 4. Simulation solver and result verification <ol style="list-style-type: none"> 4-1. Visualization of simulated results 4-2. Analysis of simulation data 5. Case study: simulation of photonic device

Teaching/Learning Methodology	Analysis, simulation and modeling of photonic devices and systems will be described and demonstrated in this subject. Students will be guided through laboratory exercises related to the materials taught in each session. The laboratory exercises should be finished during the class. Students will be given the opportunity to study some design examples in the field and share their findings with other classmates through presentations and reports. Students are requested to design a mini project of photonic devices by using the photonic simulation method.																																																				
	<table border="1"> <thead> <tr> <th data-bbox="402 405 695 468">Teaching/Learning Methodology</th> <th colspan="5" data-bbox="695 405 1433 436">Intended Subject Learning Outcomes</th> </tr> <tr> <td data-bbox="402 436 695 468"></td> <th data-bbox="695 436 841 468">a</th> <th data-bbox="841 436 987 468">b</th> <th data-bbox="987 436 1133 468">c</th> <th data-bbox="1133 436 1279 468">d</th> <th data-bbox="1279 436 1433 468">e</th> </tr> </thead> <tbody> <tr> <td data-bbox="402 468 695 510">Lectures</td> <td data-bbox="695 468 841 510">✓</td> <td data-bbox="841 468 987 510">✓</td> <td data-bbox="987 468 1133 510"></td> <td data-bbox="1133 468 1279 510">✓</td> <td data-bbox="1279 468 1433 510">✓</td> </tr> <tr> <td data-bbox="402 510 695 552">Laboratory exercises</td> <td data-bbox="695 510 841 552">✓</td> <td data-bbox="841 510 987 552">✓</td> <td data-bbox="987 510 1133 552"></td> <td data-bbox="1133 510 1279 552">✓</td> <td data-bbox="1279 510 1433 552">✓</td> </tr> <tr> <td data-bbox="402 552 695 594">Case study/report</td> <td data-bbox="695 552 841 594">✓</td> <td data-bbox="841 552 987 594">✓</td> <td data-bbox="987 552 1133 594">✓</td> <td data-bbox="1133 552 1279 594">✓</td> <td data-bbox="1279 552 1433 594">✓</td> </tr> <tr> <td data-bbox="402 594 695 636">Mini project</td> <td data-bbox="695 594 841 636">✓</td> <td data-bbox="841 594 987 636">✓</td> <td data-bbox="987 594 1133 636">✓</td> <td data-bbox="1133 594 1279 636">✓</td> <td data-bbox="1279 594 1433 636">✓</td> </tr> </tbody> </table>						Teaching/Learning Methodology	Intended Subject Learning Outcomes						a	b	c	d	e	Lectures	✓	✓		✓	✓	Laboratory exercises	✓	✓		✓	✓	Case study/report	✓	✓	✓	✓	✓	Mini project	✓	✓	✓	✓	✓											
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Student Study Effort Expected	Class contact:																																																				
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	Other student study effort:																																																				

	<ul style="list-style-type: none"> ▪ Assignments and mini project 	66 Hrs.
	Total student study effort	105 Hrs.
Reading List and References	<ol style="list-style-type: none"> 1. Layla S. Mayboudi, Geometry Creation and Import With COMSOL Multiphysics (Multiphysics Modeling Series), 2019. 2. Slawomir Sujecki, <i>Photonics Modelling and Design</i>, 2014. 3. Merhzad Tabatabaian, <i>COMSOL5 for Engineers</i>, 2015. 4. Sophocles Orfanidis, <i>Electromagnetic Waves and Antennas</i>, 2016. 5. Levent Sevgi, <i>Electromagnetic Modeling and Simulation</i>, 2014. 	

July 2022