

國立中正大學課程大綱

National Chung Cheng University Syllabus

課號 Course Code	2708012/2708012	全英文授課 EMI	<input checked="" type="checkbox"/> 是 <input type="checkbox"/> 否
課程類別 Course Type	<input type="checkbox"/> 人文關懷課程 <input type="checkbox"/> 專題導向課程 <input type="checkbox"/> 其他	<input type="checkbox"/> 競賽專題課程 <input type="checkbox"/> 總整課程	<input checked="" type="checkbox"/> 問題導向課程 <input type="checkbox"/> 實作課程
課程名稱 (中文)	專題：奈米光電		
課程名稱 (英文) Course	Special topics: Nanophotonics		
學年 Academic Year /Semester	114學年度第 2 學期	學分 Credits	3
學系 (所) Department	物理系	必選修 Compulsory/Elective	<input type="checkbox"/> 必修 Compulsory <input checked="" type="checkbox"/> 選修 Elective
上課時間 Class Hours	Monday(8、9、10)	上課地點 Classroom	Physics R303
教師 Instructor	Chia-Chen Hsu	教師 Email Instructor's Email	phycc@ccu.edu.tw
助教 Teaching Assistant	黎武清書	助教 Email TA's Email	levuthanhthu@gmail.com
先修科目或 先備能力 Prerequisites	光學		
課程概述 Course Descriptions	<p>Nanophotonics is where photonics merges with nanoscience and nanotechnology, and where spatial confinement considerably modifies light propagation and light-mater interactions. This course will introduce basic phenomena, principles, experimental advances, and potential impact of nanophotonics. The course will highlight practical issues, material properties, device feasibility of materials with nanostructured feature. The following topics will be discussed in this course.</p> <ol style="list-style-type: none"> 1. Introduction Nanoengineering and sciences, Nanophotonics materials, Nanofabrication, Nano characterization, Market and applications. 2. Foundations of nanophotonics Photons and electrons, Confinements of electron and photons, Tunneling, Localization effects, Cooperative effects, Nanoscale optical interactions, Surface plasma resonance. 3. Quantum confinement materials Quantum wells, Quantum wires, Quantum dots, Manifestations of quantum confinement, 4. Photonic crystals fundamentals Photonic crystals, Opal and inverse opal structures, One dimensional photonic crystal, Photonic bandgap, Two- and three-dimensional photonic crystals, Properties of photonic crystals and their applications, Defects in photonic crystals 5. Nonlinear optics with photonic crystals Nonlinear effects, Composite materials for nonlinear optics, Photonic bandgap nonlinear enhancements, 6. Photonic crystals slab waveguides 2D rods slab, 2D air membrane slab, microcavity and defects 		

	<p>7. Fabrication of photonic crystal. Top down techniques, Photo-lithography technique, E-beam lithography technique, Two photon lithography technique, Holography lithography technique, Bottom up techniques, Self-assembling of nano colloids, Self-assembling of block copolymers</p> <p>8. Photonic crystal fiber Conventional fiber, Photonic crystal fibers, Hollow core bandgap fibers, Solid core holey fiber, Onmi guide fiber, Nonlinear holey fiber</p> <p>9. Nanophotonics plasmonics. Surface plasma resonance basics, Surface plasma polaritons, Metallic nano shells, plasmonic waveguide</p>
學習目標 Learning Objectives	Introducing the general concept of physics for the students majoring science and engineering.
教科書及參考書 Textbooks And References	1.Nanophotonics by Prasad, Wesley, 2004 2.Nanophotonics class note by J. W. Hause et. al. 3.Nanophotonics class note by Vladimir M. Shalaev

教學要點概述					
教材編選 Teaching Materials	<input type="checkbox"/> 自製簡報(ppt)	<input checked="" type="checkbox"/> 課程講義	<input type="checkbox"/> 自編教科書		
	<input type="checkbox"/> 教學程式	<input type="checkbox"/> 自製教學影片	<input type="checkbox"/> 其他		
教學方法 Teaching Method	<input checked="" type="checkbox"/> 講述	<input type="checkbox"/> 小組討論	<input checked="" type="checkbox"/> 學生口頭報告	<input type="checkbox"/> 問題導向學習	
	<input type="checkbox"/> 個案研究	<input type="checkbox"/> 其他			
評量工具 Evaluation	<input type="checkbox"/> 期中考	<input type="checkbox"/> 期末考	<input type="checkbox"/> 隨堂測驗	<input type="checkbox"/> 隨堂作業	
	<input type="checkbox"/> 課後作業	<input checked="" type="checkbox"/> 期中報告	<input checked="" type="checkbox"/> 期末報告	<input type="checkbox"/> 專題報告	
	<input type="checkbox"/> 評量尺規	<input checked="" type="checkbox"/> 其他 Attendance (25%), Midterm oral presentation (35%), Final oral presentation (40%).			
教學資源 Teaching Resources	<input type="checkbox"/> 課程網站	<input type="checkbox"/> 教材電子檔供下載	<input type="checkbox"/> 實習網站		
與 SDGs 目標 的關聯 Related to Objectives Of SDGs	<input type="checkbox"/> SDG 1 終結貧窮		<input type="checkbox"/> SDG 2 消除飢餓		
	<input type="checkbox"/> SDG 3 健康與福祉		<input checked="" type="checkbox"/> SDG 4 優質教育		
	<input type="checkbox"/> SDG 5 性別平權		<input type="checkbox"/> SDG 6 淨水及衛生		
	<input checked="" type="checkbox"/> SDG 7 可負擔的潔淨能源		<input checked="" type="checkbox"/> SDG 8 合適的工作及經濟成長		
	<input checked="" type="checkbox"/> SDG 9 工業化、創新及基礎建設		<input type="checkbox"/> SDG 10 減少不平等		
	<input type="checkbox"/> SDG 11 永續城鄉		<input type="checkbox"/> SDG 12 責任消費及生產		

	<input type="checkbox"/> SDG 13 氣候行動	<input type="checkbox"/> SDG 14 保育海洋生態
	<input type="checkbox"/> SDG 15 保育陸域生態	<input type="checkbox"/> SDG 16 和平、正義及健全制度
	<input type="checkbox"/> SDG 17 多元夥伴關係	<input type="checkbox"/> 無關聯
教師 相關訊息 Instructor's Information	「請尊重智慧財產權，不得非法影印教師指定之教科書籍」	

每週課程內容 Weekly Scheduled Contents

Week 1 Introduction

Week 2 Foundations of nanophotonics-1

Week 3 Foundations of nanophotonics-2

Week 4 Foundations of nanophotonics-3

Week 5 Photonic crystals fundamentals-1

Week 6 Photonic crystals fundamentals-2

Week 7 Photonic crystals fundamentals-3

Week 8 Nonlinear optics with photonic crystals

Week 9 Midterm Examination (oral presentation)

Week 10 Photonic crystals slab waveguides-1

Week 11 Photonic crystals slab waveguides-2

Week 12 Fabrication of photonic crystals

Week 13 Photonic crystal fiber-1

Week 14 Photonic crystal fiber-2

Week 15 Nanophotonics plasmonics-1

Week 16 Nanophotonics plasmonics-2

Week 17 Nanophotonics plasmonics-3

Week 18 Final Examination (oral presentation)

核心能力 Core Competencies

核心能力 Core Competency	本課程與核心能力關聯強度 Degrees of related to core competencies				
	1	2	3	4	5
專業能力 Specific Competency	專業能力 1：具備物理領域之專業知識 Knowing the modern features of fluid dynamics				✓
	專業能力 2：具備策劃及執行物理及相關領域 專題研究之能力 Incubating student capabilities for reading literatures				✓
	專業能力 3：具備撰寫物理專業論文之能力 Bridging lecture content to			✓	

	modern research topics 專業能力 4:具備邏輯推理及獨立思考解決相關問題之能力 Practicing the presentation skill					V
	專業能力 5 : 具備終身自我學習成長之能力 Practicing the capability for finding answer from discussion				V	