



課 綱 Course Outline
物理學系物理組

中文課程名稱 Course Name in Chinese	近代光學				
英文課程名稱 Course Name in English	Modern Optics				
科目代碼 Course Code	PHYS30100	班 別 Degree	學士班 Bachelor' s		
修別 Type	學程 Program	學分數 Credit(s)	3.0	時 數 Hour(s)	3.0
先修課程 Prerequisite	普通物理，電磁學				
課程目標 Course Objectives					
增進學生對近代光學領域的瞭解與興趣，培養獨立思考，邏輯判斷，解決近代光學問題的能力，從普物中幾何光學的概念演伸至古典光學的波動、極化、干涉、繞射，進而探討近代光學的重要理論。					
系教育目標 Dept.'s Education Objectives					
1	物理科學人才培育，奠定物理及相關科學領域專業知識 To provide integrated education programs in view of fundamental knowledge of physical sciences and associated fields				
2	培養高科技人才 To train the talent for knowledge-intensive industries.				
3	培養繼續進修的理工人才 To train the talent for taking higher educational program in physical sciences.				
系專業能力 Basic Learning Outcomes				課程目標與系專業能力相關性 Correlation between Course Objectives and Dept.'s Education Objectives	
A	具備物理之基礎背景知識 Possessing fundamental knowledge in physical sciences.			●	
B	能運用基本物理知識與邏輯推理，分析解決物理問題 Being able to analyze and solve physics problems based on basic knowledge in physics as well as logical reasoning.			●	
C	對目前測量器材有基礎認識，且具有操作物理實驗儀器的能力 Being acquainted with modern equipment and being able to operate them for performing physics experiments.				

D	能使用基礎電腦程式語言解決物理問題 Being able to use basic computer programming for solving physics problems	
E	善用各種資訊平台進行論文資料蒐集的能力 Being able to use various platforms for data collection benefiting a topical research.	
F	具備科技發展的國際視野以及外語溝通的能力 Having an international view of the technology developments and being able to use a foreign language for communications.	
G	能整合物理與其它領域知識 Being able to integrate the knowledge of physics with that of other fields.	

圖示說明 Illustration : ● 高度相關 Highly correlated ○ 中度相關 Moderately correlated

課程大綱 Course Outline

Classical Optics

1. Wave
 - A. Complex representation of real oscillatory functions
 - B. The wave equations (phase velocity, types of solutions, dispersion, the superposition principle)
2. Electromagnetic description of light and its propagation
 - A. A wave equation from Maxwell' s equation
 - B. Electromagnetic properties of plane wave solution
 - C. Electromagnetic radiation propagation in dielectric media
 - D. Derivation of Fresnel equations; Brewster' s angle
 - E. Total internal reflection, phase shift, tunneling of light waves
- F. Optics of Metals
- G. Stoke' s treatment of reflection and refraction
- H. Geometrical optics as a limiting form of the wave theory
- I. Propagation of light in inhomogeneous media
3. Polarization of light
 - A. General discussion of polarization
 - B. Mathematical description
 - C. Stoke' s matrices and unpolarized light
4. Interference of light
 - A. Two beam interference
 - B. Coherence (temporal and spatial)
 - C. Two-slit interference
 - D. Michelson interferometer
 - E. Fabry-Perot interferometer
 - F. Diffraction grating
 - G. Interference filters
 - H. Reflective coatings
5. Diffraction
 - A. Derivation of Huygen' s principle from electromagnetic theory
 - B. Fresnel diffraction
 - C. Fraunhofer diffraction, single slit and circle
6. Scattering from small particles

Modern Optics:

7. Fourier optics
8. Optical processing

9. Gaussian beams 10. Optical resonators and optical modes 11. Optical filters 12. Light propagation in crystal 13. Electro-optic effects and devices 14. Non-linear optics A. harmonic generation B. Parametric amplification C. Phase conjugation 15. Interaction of radiation with atomic systems 16. Linear oscillation 17. Lasers
資源需求評估（師資專長之聘任、儀器設備的配合．．．等） Resources Required (e.g. qualifications and expertise, instrument and equipment, etc.)
物理專業師資、相關圖書資料、影印機、投影機、幻燈機、示範實驗設備
課程要求和教學方式之建議 Course Requirements and Suggested Teaching Methods
授課，示範實驗、習題討論、演練，期中與期末考試、報告
其他 Miscellaneous
課程相關進度請見網站： http://faculty.ndhu.edu.tw/~clcheng/class-97/Optics97/Optics97.htm