



課 綱 Course Outline
物理學系物理組

中文課程名稱 Course Name in Chinese	雷射物理				
英文課程名稱 Course Name in English	Laser Physics				
科目代碼 Course Code	PHYS30900	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					
課程目標 Course Objectives					
簡介雷射的發光原理、雷射系統的基本架構、工作原理和特性，以及雷射調變技術:如脈衝壓縮技術等。在雷射光學部分則介紹雷射光束的傳播理論及匯聚特性。					
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

1. 雷射光束的基本傳播特性。
2. 物質與光輻射場的相互作用（原子能階的量子化及三種基本過程）。
3. 雷射系統的基本組成（泵浦：居量反轉，雷射介質及光學共振腔）。
4. 譜線寬度與加寬（均勻加寬與非均勻加寬，Hole Burning）。
5. 雷射共振腔及模態之理論分析（共振腔穩定性條件，縱模與橫模）。
6. 高斯雷射光束的傳播與匯聚特性（ABCD Law and COLLINS Chart）。
7. 氣體雷射、固態雷射、半導體雷射、染料雷射、光纖放大器及準分子雷射介紹
8. 雷射單色性及方向性的改良技術。
9. 雷射脈衝寬度的壓縮技術（Q-Switching and Mode Locking）。

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.)

課程要求和教學方式之建議
Course Requirements and Suggested Teaching Methods

其他
Miscellaneous

Textbook: Photonics: Optical Electronics in Modern Communications
by Amnon Yariv (Author), Pochi Yeh (Author)
References: [1] Optics
Oxford University Press; 6 edition (January 26, 2006) by Eugene Hecht
Addison-Wesley; 4 edition (August 12, 2001)
[2] Lasers by Anthony E. Siegman
University Science Books; New edition edition (May 1, 1986)