

课程详述

COURSE SPECIFICATION

以下课程信息可能根据实际授课需要或在课程检讨之后产生变动。如对课程有任何疑问，请联系授课教师。

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	课程名称 Course Title	激光原理 Laser Fundamentals
2.	授课院系 Originating Department	物理系 Physics Department
3.	课程编号 Course Code	PHY324
4.	课程学分 Credit Value	3
5.	课程类别 Course Type	专业核心课 Major Core Courses 专业选修课 Major Elective Courses
6.	授课学期 Semester	春季 Spring
7.	授课语言 Teaching Language	中英双语 English & Chinese
8.	授课教师、所属学系、联系方式（如属团队授课，请列明其他授课教师） Instructor(s), Affiliation & Contact (For team teaching, please list all instructors)	黄明远 Huang Mingyuan 物理系 Department of physics Email: huangmy@sustech.edu.cn Office: 113, 2nd researcher building Phone: 0755-88010343
9.	实验员/助教、所属学系、联系方式 Tutor/TA(s), Contact	待公布 To be announced
10.	选课人数限额(可不填) Maximum Enrolment (Optional)	

11. 授课方式 Delivery Method	讲授 Lectures	习题/辅导/讨论 Tutorials	实验/实习 Lab/Practical	其它(请具体注明) Other (Please specify)	总学时 Total
学时数 Credit Hours	48	0	0	0	48

12. 先修课程、其它学习要求
Pre-requisites or Other Academic Requirements

近代光学 Modern Optics (PHY307)
原子物理学 Atomic Physics (PHY210)

13. 后续课程、其它学习规划
Courses for which this course is a pre-requisite

无
NA

14. 其它要求修读本课程的学系
Cross-listing Dept.

无
NA

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

要求理解光的量子 and 波动特性，掌握激光放大、激光谐振腔，了解具体的激光系统原理
Comprehend the quantum and wave properties of light, grasp the theory of laser amplifiers and laser resonators, and understand the principle and function of specific laser systems.

16. 预达学习成果 Learning Outcomes

修完本课程，希望学生对产生激光的物理机制，以及固体、气体、染料激光器的原理有所了解。
After finishing this course, I hope that most of students could understand the physical mechanism to generate laser, and the basic principle of gas-, solid-, and dye-laser systems.

17. 课程内容及教学日历 (如授课语言以英文为主，则课程内容介绍可以用英文；如团队教学或模块教学，教学日历须注明主讲人)

Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)

- 1) Fundamental wave properties of light (week 1)
Wave nature of light- the interaction of light with materials
 - 2) Fundamental quantum properties of light (week 2-4)
Particle nature of light- discrete energy levels; Radiative transitions and emission linewidth; energy levels and radiative properties of molecules, liquids, and solids; Radiation and thermal equilibrium- absorption and stimulated emission.
 - 3) Laser Amplifiers (week 5-9)
Conditions for producing a laser- population inversion, gain, and gain saturation; Laser oscillation above threshold; requirements for obtaining population inversions; Laser pumping requirements and techniques.
 - 4) Laser resonators (week 10-14)
Laser cavity modes; Stable laser resonators and Gaussian beams; Special laser cavities and cavity effects.
 - 5) Specific laser systems (week 15-16)
Laser systems involving low- and high-density gain media; free electron laser.
- 1) 光的波动特性 (第 1 周)
光以及光与物质相互作用的波动特性。
 - 2) 光的量子特性 (第 2-4 周)
光的例子特性, 能量不连续; 能级跃迁辐射与线宽; 分子, 液体与固体的能级与辐射特性; 辐射, 热平衡, 吸收与受激辐射。
 - 3) 激光放大器 (第 5-9 周)
用于制备激光条件: 集居数反转, 增益和增益饱和; 激光阈值以上振荡; 获得集居数反转的条件; 激光泵浦的需求和技术。
 - 4) 激光谐振器 (第 10-14 周)
激光腔模式; 稳定的激光谐振器和高斯光束; 特殊的激光腔和腔体的影响。
 - 5) 具体的激光系统 (第 15-16 周)
激光系统包括低和高密度的增益介质, 自由电子激光器。

18. 教材及其它参考资料 Textbook and Supplementary Readings

Text book
Laser Fundamentals, William T. Silfvast, Cambridge University Press
Reference: Principles of laser, Orazia Svelto, David C. Hanna

课程评估 ASSESSMENT

19. 评估形式 Type of Assessment	评估时间 Time	占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance		10%		
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		10%		

期中考试 Mid-Term Test	40%		
期末考试 Final Exam	40%		
期末报告 Final Presentation			
其它（可根据需要 改写以上评估方 式） Others (The above may be modified as necessary)			

20. 记分方式 **GRADING SYSTEM**

- A. 十三级等级制 **Letter Grading**
 B. 二级记分制（通过/不通过） **Pass/Fail Grading**

课程审批 REVIEW AND APPROVAL

21. 本课程设置已经过以下责任人/委员会审议通过
This Course has been approved by the following person or committee of authority

物理系教学指导委员会
 Education Instruction Committee of Physics department

