

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	近代光学 Modern Optics				
2.	授课院系 Originating Department	物理系 Physics department				
3.	课程编号 Course Code	PHY307				
4.	课程学分 Credit Value	3				
5.	课程类别 Course Type	专业核心 Major-Core				
6.	授课学期 Semester	秋季 Fall				
7.	授课语言 Teaching Language	以中文为主，教材以及授课 PPT 为英文 Language: Chinese; Textbook & Notes: English				
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)	戴俊峰/ Junfeng Dai 助理教授/ Assistant Professor 物理系/ Physics Department 第二科研楼 225 室/ Rm 225, Research Building II Email: daijf@sustech.edu.cn Tel.: 0755-88018223				
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	无 N/A	无 N/A	考试周不算入总学时 Exclude examination week	48

<p>12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements</p>	<p>大学物理 B 下 (PHY105B) General Physics B (II) (PHY105B)</p>
<p>13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite</p>	<p>本课程为物理学专业核心课程，是激光原理课程的先修课程； This course is a major-core course in physics and is also a prerequisite course for the course of laser principles.</p>
<p>14. 其它要求修读本课程的学系 Cross-listing Dept.</p>	

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

光学是研究光的本质、光的传播规律以及光与物质相互作用的科学。本课程主要内容包括光的基本性质以及其与介质的相互作用；光的几何光学传播规律和成像基本理论、显微镜技术；光的干涉原理、典型干涉装置及其应用；光的衍射原理和现象、光栅技术及其应用；光偏振态的产生方法和原理、偏振态的检验与转换、偏振光干涉技术的应用；激光的产生原理等。通过本课程的学习，学生应能对光的基本概念、光与物质相互作用原理以及典型光学系统有较为深刻的认识，为进一步学习激光技术和从事光学研究打下坚实的基础。

Modern optics is focused on the study of basic properties of light, the law of light propagation and the interaction between light and matter. The main contents of this course include the basic properties of light and its interaction with the matter; the law of geometrical optics and basic theory of imaging, microscopy technology; the principle of interference, typical interference devices and their application; the principle and phenomenon of diffraction, Grating technology and its application; the principle of the polarization state of light, the inspection and conversion of polarization state, the application of polarization interference technology; the principle of laser generation. Through this course, students should be able to understand the basic concepts and principles of optics and its typical applications, which form a solid foundation for further study of laser technology and optical research.

16. **预达学习成果 Learning Outcomes**

修完本课程，希望学生了解电磁场理论基础、光在界面的反射透射，光的干涉、衍射、偏振，了解几何光学原理以及像差，傅立叶光学基础以及现代光学（激光原理与非线性光学基础）。

Through this course, students are expected to understand the basic theory of electromagnetic fields, the transmission and reflection of light at the interface, the phenomena of interference, diffraction and polarization. Besides, grasp the basic principle of geometrical optics and aberration, Fourier optics and modern optics (including laser principle and nonlinear optics)

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) The mathematics of wave motion (波运动方程的数学描述)
The first week: The mathematics of wave motion. (第一周: 波运动方程的数学描述)
- 2) Electromagnetic theory, photons and light (电磁场理论, 光子和光)
The second and third weeks: Basic laws of electromagnetic theory, electromagnetic waves, energy, radiation, light in bulk matter, the electromagnetic-photon spectrum. (第二和第三周: 电磁场基本理论, 电磁波, 能量, 辐射, 光与物质相互作用, 光谱)
- 3) The propagation of light (光的传播)
The fourth week: Rayleigh scattering, reflection, refraction, Fermat's principle, the electromagnetic approach, total internal reflection, optical properties of metals. (第四周: 瑞丽散射, 反射, 衍射, 费马原理, 麦克斯韦方程, 全反射以及金属的光学性质)
- 4) Geometrical optics (几何光学)
The fifth and sixth weeks: Lenses, stops, mirrors, prisms, fiberoptics, optical systems (第五和六周: 透镜, 镜子, 棱镜, 光纤, 光学系统)
- 5) More on geometrical optics (更多关于几何光学)
The sixth and seventh weeks: Thick lenses and lens systems, aberrations. (第六和七周: 厚透镜和透镜系统, 畸变)
- 6) The superposition of waves (波的叠加)
The eighth and ninth weeks: The addition of waves of the same frequency and different frequency, anharmonic periodic waves, nonperiodic waves (including the fundamental Fourier transforms). (第八和九周: 同频率和不同频率波的叠加, 非谐波周期波, 非周期波 (包括傅里叶变换基础))
- 7) Interference (干涉)
The tenth, eleventh and twelfth weeks: Conditions for interference, wavefront-splitting interferometers, amplitude-splitting interferometers, types and localization of interference fringes, multiple beam interference, applications of single, multilayer films and interferometry. (第十, 十一和十二周: 干涉条件, 波前劈裂干涉仪, 振幅劈裂干涉仪, 干涉条纹的类型, 多束干涉, 单层和多层膜的应用)
- 8) Diffraction (衍射)
The twelfth, thirteenth and fourteenth weeks: Fraunhofer diffraction, Fresnel diffraction, Kirchhoff's scalar diffraction theory, boundary diffraction waves (第十二, 十三和十四周: 夫琅禾费衍射, 费内尔衍射, 基尔霍夫的衍射理论, 边界衍射波)
- 9) Polarization (偏振)
The fourteenth, fifteen and sixteenth weeks: The nature of polarized light, polarizers, dichroism, birefringence, scattering and polarization, polarization by reflection, retarders, circular polarizers, polarization of polychromatic light, optical activity, induced optical effects-optical modulators, liquid crystals (第十四, 十五和十六周: 偏振光的性质, 偏振片, 二向色性, 双折射, 散射和偏振, 反射与偏振, 延迟片, 圆偏振片, 复合光的偏振, 光学腔, 光电以及磁光效应)
- 10) Modern optics: laser and other topics (现代光学: 激光以及其他主题)
The sixteenth week: Lasers and laserlight, nonlinear optics. (第十六周: 激光和非线性光学)

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

指定教材/Textbook: Optics, Eugene Hecht 张存林 改编, 高等教育出版社

推荐参考资料/Reference: 光学, 赵凯华 钟锡华, 北京大学出版社

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				
课堂表现 Class Performance		10% (额外加分 /bonus)		
小测验 Quiz		40%		
课程项目 Projects				
平时作业 Assignments		10%		
期中考试 Mid-Term Test				
期末考试 Final Exam		50%		
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