

## 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 <b>Course Title</b>	固体光电子学 Optical Properties of Solids				
2.	授课院系 <b>Originating Department</b>	物理系 Department of Physics				
3.	课程编号 <b>Course Code</b>	PHY330				
4.	课程学分 <b>Credit Value</b>	3				
5.	课程类别 <b>Course Type</b>	专业选修课 Major Selective Course				
6.	授课学期 <b>Semester</b>	春季 Spring				
7.	授课语言 <b>Teaching Language</b>	英语 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） <b>Instructor(s), Affiliation &amp; Contact</b> (For team teaching, please list all instructors)	张立源：物理系，email: zhangly@sustc.edu.cn Liyuan Zhang, Department of Physics, email: zhangly@sustc.edu.cn				
9.	实验员/助教、所属学系、联系方式 <b>Tutor/TA(s), Contact</b>	待公布 To be announced				
10.	选课人数限额(可不填) <b>Maximum Enrolment (Optional)</b>	30				
11.	授课方式 <b>Delivery Method</b>	讲授 <b>Lectures</b>	习题/辅导/讨论 <b>Tutorials</b>	实验/实习 <b>Lab/Practical</b>	其它(请具体注明) <b>Other (Please specify)</b>	总学时 <b>Total</b>
	学时数 <b>Credit Hours</b>	48	0	0	期末考试不算入总学时	48

12. 先修课程、其它学习要求 <b>Pre-requisites or Other Academic Requirements</b>	量子力学 I (PHY206-15), 近代光学 (PHY307) Introduction to Quantum Mechanics (PHY206-15), Modern Optics (PHY307)
13. 后续课程、其它学习规划 <b>Courses for which this course is a pre-requisite</b>	光电子学, Photo electronics;
14. 其它要求修读本课程的学系 <b>Cross-listing Dept.</b>	无 N/A

教学大纲及教学日历 SYLLABUS

15. 教学目标 **Course Objectives**

The course covers the optical physics of solid state materials. It begins with the classical description of optical propagation and reflectivity. It then covers the treatment of absorption and luminescence by quantum theory, and the modifications caused by excitonic effects. The phenomena are illustrated by discussing the optical properties of insulators, semiconductors, and metals. The infrared properties of ionic systems are discussed, and the course concludes with a brief introduction to nonlinear crystals.

本课程主要涉及固体材料的光学性质, 课程从固体材料中的光传输和反射经典描述开始, 接着用量子理论处理固体材料中光的吸收和发光问题, 又进一步说明和讨论绝缘体, 半导体, 和金属等材料的光学性质和物理现象, 此外还讨论离子系统的红外特性, 最后简单介绍一下非线性晶体的一些内容。

16. 预达学习成果 **Learning Outcomes**

The aims of the course are as follows:

- to understand the classical theory of light propagation in solid state materials;
- to understand the quantum theory of absorption and emission in solids;
- to appreciate the importance of excitonic effects in solids;
- to understand the origin of nonlinear optical effects in crystals.

掌握固体材料中光传播的经典理论, 掌握固体材料中的光吸收和发射的量子理论,  
认识固体中激子效应的重要性, 掌握晶体中的非线性效应的基本原理。

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.)**

Lecture	Topic
1 – 2	Introduction, the complex refractive index
3 – 4	Lorentz oscillators, dispersion, birefringence
5 - 6	Interband absorption, excitons
7 – 8	Luminescence
9 – 10	Quantum confined structures
11 – 12	Metals, doped semiconductors
13 - 14	Phonon absorption and reflectivity
15 - 16	Nonlinear optics

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

- Fox, *Optical Properties of Solids*, Oxford University Press (2th Edition 2010)
- Kittel, *Introduction to Solid State Physics* (7th Edition, Wiley, 1996)
- Burns, *Solid State Physics* (Academic Press, 1985)

19. 评估形式 Type of Assessment	评估时间 Time	课程评估 ASSESSMENT		
		占考试总成绩百分比 % of final score	违纪处罚 Penalty	备注 Notes
出勤 Attendance	54	10%	-0.5%	
课堂表现 Class Performance				
小测验 Quiz				
课程项目 Projects	18	30%		
平时作业 Assignments	18	10%		
期中考试 Mid-Term Test	2	30%		
期末考试 Final Exam				

期末报告 <b>Final Presentation</b> 其它（可根据需要 改写以上评估方 式） <b>Others (The          above may be          modified as          necessary)</b>	20	20%		

20. 记分方式 **GRADING SYSTEM**

<input checked="" type="checkbox"/> A. 十三级等级制 <b>Letter Grading</b> <input type="checkbox"/> B. 二级记分制（通过/不通过） <b>Pass/Fail Grading</b>
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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
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