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**	量子材料 Quantum Materials
2.	**授课院系** **Originating Department**	物理系 Department of Physics
3.	**课程编号** **Course Code**	PHY360
4.	**课程学分 Credit Value**	3
5.	**课程类别** **Course Type**	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）**	陈卓昱、理学院物理系、13590194095 Chen Zhuoyu, Department of Physics, College of Science, 13590194095
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）**	25

		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
11.	授课方式 Delivery Method					
	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	量子力学 II（PHY305）与 固体物理（PHY321-15） Quantum Mechanics II (PHY305) and Introduction to Solid State Physics (PHY321-15) 或 or 应用量子力学（MSE344）与 应用固体物理（MSE335） Applied Quantum Mechanics（MSE344）and Applied Solid State Physics（MSE335）
13.	后续课程、其它学习规划 Courses for which this course is a pre-requisite	无 None
14.	其它要求修读本课程的学系 Cross-listing Dept.	材料科学与工程系 Department of Materials Science and Engineering

教学大纲及教学日历 SYLLABUS

15. 教学目标 Course Objectives

本课程旨在帮助学生掌握量子材料的基本概念、分类及其物理机制。通过学习超导材料、拓扑材料、磁性材料等典型量子材料，学生将了解其特性及应用前景，培养分析和解决问题的能力，并拓展在前沿研究领域的视野，为进一步科研或技术开发奠定基础。课程教学内容强调历史与前沿研究相结合，基础概念和技术应用结合，全面且有重点地展示量子领域领域的全貌。

This course aims to help students grasp the basic concepts, classification, and physical mechanisms of quantum materials. By studying typical quantum materials such as superconducting materials, topological materials, and magnetic materials, students will understand their characteristics and application prospects, and expand their horizons in research frontiers. The course emphasizes the combination of history and cutting-edge research, as well as the integration of basic concepts and technical applications, aiming to comprehensively showcase the field of quantum materials.

16. 预达学习成果 Learning Outcomes

完成本课程后，学生应能：

1. 理解量子材料的基本概念、分类和发展前沿。
2. 掌握超导、拓扑、磁性等典型量子材料的特性及应用。
3. 分析不同量子材料的物理机制及结构特性。
4. 拓展在量子材料前沿领域的研究视野，为进一步学习和科研打下基础。

Upon completion of this course, students should be able to:

1. Understand the basic concepts, classification, and research frontiers of quantum materials.
2. Understand the characteristics and applications of typical quantum materials such as superconducting, topological, and magnetic materials.
3. Understand the physical mechanisms and structural features of different quantum materials.
4. Expand their research horizons in the forefront of quantum materials and lay the foundation for further study and scientific research.

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. 量子材料总论（量子材料概念、定义、历史、分类及示例）6 学时
2. 超导材料（常规超导材料、二维超导材料、高温超导材料）18 学时
3. 拓扑材料（量子霍尔效应家族、拓扑绝缘体、拓扑半金属）10 学时
4. 磁性材料（铁磁材料、反铁磁材料、自旋电子材料）4 学时
5. 铁电与多铁材料 2 学时
6. 热电材料 2 学时
7. 总结讨论与复习 6 学时

1. General Introduction to Quantum Materials (Concepts, Definitions, History, Classification, and Examples) 6 hours
2. Superconducting Materials (Conventional Superconductors, Two-Dimensional Superconductors, High-Temperature Superconductors) 18 hours
3. Topological Materials (Quantum Hall Effect Family, Topological Insulators, Topological Semimetals) 10 hours
4. Magnetic Materials (Ferromagnetic Materials, Antiferromagnetic Materials, Spintronic Materials) 4 hours
5. Ferroelectric and Multiferroic Materials 2 hours
6. Thermoelectric Materials 2 hours
7. Summary Discussions and Reviews 6 hours

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

教材：本课程无指定教材。
参考资料：《中国量子物质与应用 2035 发展战略》

Textbook: There is no designated textbook for this course.
Supplementary Readings:《China's Quantum Materials and Applications Development Strategy 2035》

南方科技大学
SOUTHERN UNIVERSITY OF SCIENCE AND TECHNOLOGY

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
课堂表现 Class Performance		10%		
平时作业 Assignments		30%		
期末综述论文 Final Review Paper		30%		
期末报告 Final Presentation		30%		

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

教学负责人签字：
日期：