课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	**超导物理专题选讲 Topics in Superconductivity**
2.	**课程性质** **Compulsory/Elective**	选修课 Elective Course
3.	**课程学分/学时** **Course Credit/Hours**	3/48
4.	**授课语言** **Teaching Language**	中文 Chinese
5.	**授课教师** **Instructor(s)**	陈卓昱　Zhuoyu Chen
6.	**是否面向本科生开放** **Open to undergraduates or not**	是 Yes
7.	**先修要求** **Pre-requisites**	量子力学 II PHY305 和固体物理 PHY321-15 Quantum Mechanics II and Introduction to Solid State Physics 本科生研究生先修要求相同 Same for undergraduates and graduates.

8. **教学目标**
Course Objectives

超导体在临界温度以下具有零点阻和完全抗磁性两种物理性质。自 1911 年第一个汞超导体被发现以来，超导物理至今仍是凝聚态物理的核心课题。1986 高温超导体被发现，不同于此前发现的金属和合金等低温超导体，这类材料只需要降温到一个相对较高的温度（比如 93 K 的 Y-Ba-Cu-O 体系），就可实现完全没有电阻地导电，同时对很强的磁场产生排斥效应。高温超导材料被发现至今已经三十多年，然而其中微观物理机制依然是个谜。在传统的金属合金超导体中，电子借助吸引相互作用而两两配对，并在低温下凝聚成超流态，从而电流可以无阻力地流动。而高温超导体的配对机理，仍然是当今物理学皇冠上的明珠。理解了高温超导机理，可以帮助我们设计常温超导体，造福社会。本课程沿着超导物理研究的历史脉络，研讨超导物理的基本理论以及实验进展，侧重于非常规超导实验研究方面的讨论。本科生研究生课程内容相同。

Superconductors exhibit zero resistance and complete diamagnetism below critical temperatures. Since the discovery of the first Mercury superconductor, superconductivity has been the central topic in condensed matter physics. In 1986, a new class of materials called high-temperature superconductors (HTS) was discovered. Unlike conventional metal or alloy superconductors with low critical temperatures, HTS can achieve zero resistance and complete diamagnetism at much higher temperature (e.g. 93 K for Y-Ba-Cu-O). Although more than 3 decades has past, the mechanism of HTS is still a mystery. The understanding of HTS could potentially help us design room-temperature superconductors and benefit the society.
This course lays out the history of the research of superconductivity, discuss the basic theory and experimental progress in the field, with emphasis in experimental research in unconventional superconductivity. The course content will be same for undergraduates and graduates.

9. **教学方法**
Teaching Methods

以教师课堂教授为主，学生文献阅读和讨论为辅。本科生研究生教学方法相同。
Mainly teacher' classroom teaching, supplemented by students' literature reading and discussion. Undergraduate and graduate teaching methods are the same.

10. **教学内容**
Course Contents

	Section 1	超导研究历史总览 Overview of superconductivity research history

Section 2	量子力学、固体物理内容回顾 Review on Quantum mechanics and Solid state physics
Section 3	早期常规超导实验研究 Early experimental research on conventional superconductivity
Section 4	常规超导理论 Conventional superconductivity theory
Section 5	低维超导体 Low-dimensional superconductivity
Section 6	高温超导的实验发现 Experimental discovery of HTS
Section 7	高温超导的实验研究 Experimental research of HTS
Section 8	高温超导理论进展 HTS theory progresses
Section 9	其他非常规超导体 Other unconventional superconductors

11. 课程考核
Course Assessment

考核形式：课堂讨论、平时文献综述报告（书面和演讲）、期终前沿调研报告（书面和演讲）。
分数构成：上述三部分分别占比 20%、40%、40%
本科生与研究生考核方式相同，标准相同。

Assessment: classroom discussion, literature review report (written and speech), and final frontier research report (written and speech).
Score composition: the above three parts account for 20%, 40% and 40% respectively
The assessment methods and standards of undergraduates and postgraduates are the same.

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

1. 教师自编教案 Teacher's slides
2. 原始文献 Original literature
3. Michael Tinkham, Introduction to Superconductivity