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**	量子力学 I　Introduction to Quantum Mechanics
2.	**授课院系 Originating Department**	物理系　Department of Physics
3.	**课程编号 Course Code**	PHY206-15
4.	**课程学分 Credit Value**	3
5.	**课程类别 Course Type**	专业基础课 Major Foundational Courses
6.	**授课学期 Semester**	春季/秋季　Spring/Fall
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）**	许志芳，副教授，物理系 创园 10 栋 102 室 Xu Zhifang, Associate Professor, Department of Physics Rm.102, No.10 CHUANG Yuan xuzf@sustech.edu.cn Phone: 88018238 黄丽，助理教授，物理系 二科 212 Huang Li, Assistant Professor, Department of Physics Rm. 212, Research Building 2 huangl@sustech.edu.cn Phone: 88018268
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			复习、考试（2 周，不占用上课时间）	48

12. 先修课程、其它学习要求 Pre-requisites or Other Academic Requirements	数学物理方法 （PHY203-15） Mathematical Methods in Physics (PHY203-15); 分析力学 （PHY205-15） Analytical Mechanics（PHY205-15）
13. 后续课程、其它学习规划 Courses for which this course is a pre-requisite	本课程为物理专业基础课，是大部分专业核心课的先修课程。 This course is a major basic course, a pre-requisite for most major core courses of physics.
14. 其它要求修读本课程的学系 Cross-listing Dept.	

教学大纲及教学日历 SYLLABUS

15. **教学目标 Course Objectives**

本课程讲授量子力学的基本知识，包括量子力学的基本假设，Schrodinger 方程，海森堡不确定关系，几率诠释，量子力学的数学基础，一维量子力学模型，中心势场模型，氢原子问题的求解，角动量和自旋，全同粒子系统等。

In this course, we introduce the fundamental principles of quantum mechanics including basic hypotheses of quantum mechanics, Schrodinger equation, Heisenberg uncertainty principle, the statistical interpretation of wavefunction, the mathematical frame of quantum mechanics, one-dimensional models, models of central force, hydrogen atom, angular momentum and spin, identical particles, etc..

16. **预达学习成果 Learning Outcomes**

修完本课程，要求掌握量子力学的基本原理，理解量子力学中的角动量和自旋，以及全同粒子的物理，能够运用这些基本原理来处理简单的量子系统，如一维散射模型，谐振子模型，中心势场问题。

On successful completion of the course, students should understand the fundamental principles of quantum mechanics, the angular momentum and spin in quantum mechanics, identical particles, and be able to deal with simple quantum systems such such as 1D scattering model, harmonic oscillators, central potential problems, etc .

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．波函数

1. The wave function

第 1 周：薛定谔方程；统计诠释

Week 1: The Schrodinger equation; The statistical interpretation;

第 2 周：概率；归一化

Week 2: Probability; Normalization;

第 3 周：动量；不确定原理

Week 3: Momentum; The uncertainty principle.

2．定态薛定谔方程

2. Time-independent Schrodinger equation

第 4 周：定态；无限深势阱

Week 4: Stationary states; The infinite square well;

第 5 周：谐振子；自由粒子

Week 5: The harmonic oscillator; The free particle;

第 6 周：delta 函数势；有限深方势阱

Week 6: The delta-function potential; The finite square well.

3．形式理论

3. Formalism

第 7 周：希尔伯特空间；可观测量

Week 7: Hilbert space; observables;

第 8 周：厄米算符的本征函数；广义统计诠释

Week 8: Eigenfunctions of a Hermitian operator; Generalized statistical interpretation;

第 9 周：不确定原理；狄拉克符号

Week 9: The uncertainty principle; Dirac notation;

4．三维空间中的量子力学

4. Quantum mechanics in three dimensions

第 10 周：球坐标系中的薛定谔方程

Week 10: Schrodinger equation in spherical coordinates;

第 11 周：氢原子

Week 11: The hydrogen atom;

第 12 周：角动量

Week 12: Angular momentum;

第 13 周：自旋

Week 13: Spin

5．全同粒子

5. Identical particles

第 14 周：两粒子系统

Week 14: Two-particle systems;

第 15 周：原子

Week 15: Atoms;

第 16 周：固体；量子统计力学

Week 16: Solids; Quantum statistical mechanics

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

指定教材(Textbook): David J. Griffiths, Introduction to Quantum Mechanics, (英文版.原书第 2 版), 机械工业出版社.

推荐参考书(References):

量子力学卷 I，曾谨言，科学出版社

Quantum Mechanics, Landau and Lifshitz, 世界图书出版社

Modern quantum mechanics, J.J.Sakurai and J. Napolitano, 世界图书出版社

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				
小测验 Quiz				
课程项目 Projects				
平时作业 Assignments		20%		
期中考试 Mid-Term Test		35%		
期末考试 Final Exam		45%		
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