课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	PHY5001/高等量子力学 Advanced Quantum Mechanics
2.	**课程性质** **Compulsory/Elective**	专业核心课 Degree Compulsory Course
3.	**课程学分/学时** **Course Credit/Hours**	4/64
4.	**授课语言** **Teaching Language**	英文 English
5.	**授课教师** **Instructor(s)**	叶飞 Fei Ye
6.	**是否面向本科生开放** **Open to undergraduates or not**	是 YES
7.	**先修要求** **Pre-requisites**	（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.） 量子力学 II/Quantum Mechanics PHY305

8. **教学目标**
Course Objectives

（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

本课程为研究生及本科高年级学生讲授量子力学的进阶内容。课程内容基本包括涵盖 (1) 量子力学和经典力学的对应关系；(2) 量子力学中的位相和规范变换；(3) 路径积分表述；（4）对称性和守恒率；（5）角动量理论；（6）相互作用绘景和微扰； (7) 量子散射理论等内容。 根据实际情况，每学期教学内容可能有微小调整。

This course introduces postgraduates and senior undergraduates to theory and advanced techniques in quantum mechanics. It basically covers the following contents: (1) the correspondence between quantum mechanics and classical mechanics; (2) phase and gauge transformation in quantum mechanics; (3) path integral representation of quantum mechanics; (4) symmetry and conservation laws; (5) theory of angular momentum; (6) interaction picture and perturbation; (7) quantum scattering theory etc. The actual contents of this course could be slightly modified.

9. **教学方法**
Teaching Methods

（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

本课程以课堂教学为主。全英文教材。

Class teaching with English textbook.

10. **教学内容**
Course Contents
（如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

	Section 1	基本概念（Stern-Gerlach 实验；狄拉克符号；基矢和算符矩阵；测量、可观测量和不确定关系；基变换；位置、动量和平移；动量空间和坐标

		空间的波函数）周 1-2 Fundamental Concepts (The Stern-Gerlach Experiment; Dirac Notation and Operators; Base kets and Matrix Representation; Measurements, Observables & The Uncertainty Relation; Change of Basis; Position, Momentum, and Translation; Wave Functions in Position and Momentum Space) Week 1-2
	Section 2	量子动力学（时间演化和薛定谔方程；薛定谔和海森堡绘景；相互作用绘景；谐振子；传播子和路径积分；规范变换）周 3-5 Quantum Dynamics (Time Evolution and the Schrodinger Equation; The Schrodinger versus the Heisenberg Picture; Interaction picture; Simple Harmonic Oscillator; Propagators and Feynman Path Integrals; The Gauge Transformation) Week 3-5
	Section 3	角动量理论（转动和角动量；转动群和欧拉角；角动量的本征值和本征矢；Schwinger 谐振子 模型；角动量耦合和 CG 系数；自旋关联测量和贝尔不等式）周 6-10 Theory of Angular Momentum (Rotation and Angular Momentum; Rotation Group and the Euler Angles; Eigenvalues and Eigenkets of Angular Momentum; Schwinger Oscillator Model; Combination of Angular Momentum and Clebsh-Gordan Coefficient; Spin Correlation Measurements and Bell's Inequality) Week 6-10
	Section 4	物理学中的对称性（对称性和守恒律；离散对称性；置换对称性和全同粒子；时间反演对称性）周 11-12 Symmetries in Physics (Symmetries and Conservation Laws; Discrete Symmetries; Permutation Symmetry and Identical Particles; Time Reversal Symmetry) Week 11-12
	Section 5	散射理论（微分散射截面；玻恩近似；分波法和相移等内容）周 13-16 Scattering Theory (Differential scattering cross section; Born approximation; partial waves and phase shifts; etc.) Week 13-16

11. 课程考核
Course Assessment

（1 考核形式 Form of examination；2.分数构成 grading policy；3 如面向本科生开放，请注明区分内容。 If the course is open to undergraduates, please indicate the difference.）

平时作业 40%，期中考试 30%，期末考试 30%；（比例可能根据实际情况有所调整）

Assignments 40%, mid-term examination 30%, final examination 30%；(The ratio could be slightly modified).

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

Sakurai Napolitano, Modern Quantum Mechanics (2nd edition)