课程大纲
COURSE SYLLABUS

1.	**课程代码/名称** **Course Code/Title**	IQS5002 量子比特, Quantum Bits
2.	**课程性质** **Compulsory/Elective**	选修, Elective
3.	**课程学分/学时** **Course Credit/Hours**	3.0 / 48H
4.	**授课语言** **Teaching Language**	中文为主，辅以英文 Chinese with some explanations in English
5.	**授课教师** **Instructor(s)**	李剑 Li Jian
6.	**先修要求** **Pre-requisites**	高等数学、大学物理 Advanced Mathematics, College Physics

7. 教学目标
Course Objectives

量子计算机作为一种可超越传统计算机的新兴计算技术近年来发展迅猛，量子计算机研发不仅具有重大科学意义，对国民经济、国防等领域也具有极大的战略价值，因此受到了各国政府、科研机构和 IT 产业界跨国公司的广泛关注。

本门课程的目标是对量子计算机底层物理硬件最基本的单元**量子比特**作较全面的介绍，通过本门课程的学习，学生将对各种量子比特物理实现的特点、优势、发展现状和实验研究方法有较深入的了解。

Quantum computer, as an emerging computational technology which can surpass classical computers, evolves rapidly in recent years. Due to its great scientific significance, as well as the strategic values in national economy and defence, development of quantum computer draws much attention to governments, research institutes and multinational corporations in IT industry.

The objective of this course is to give a detailed and systematic introduction to the basic unit of quantum computer hardware – the quantum bit (qubit). From this course, students will gain in-depth understanding of the properties, advantages, state of the art and experimental techniques of the various physical qubit implementations.

8. 教学方法
Teaching Methods

课堂授课，辅以实验室参观。Lectures and Lab Tour

9. 教学内容
Course Contents

Section 1	量子力学基本概念 Basic concepts of quantum mechanics
Section 2	经典比特与量子比特 Classical bit vs. quantum bit (qubit)
Section 3	开放量子系统 Open quantum system
Section 4	量子测量 Quantum measurement
Section 5	低温和超导基础 Basics of cryogenics and superconductor
Section 6	固态量子比特 Solid-state qubits
Section 7	非固态量子比特 Non-solid-state qubits

10.	**课程考核** **Course Assessment**
	请再此注明：①考查/考试；②分数构成。 ①考查　Inspect ②分数构成　Grade 平时出勤占 30%，期末做 15 分钟报告占 70%　Lecture attendance 30%, 15 min. final seminar 70%
11.	**教材及其它参考资料** **Textbook and Supplementary Readings**
	(1) 课堂讲义 Lecture notes (2) 教材：Michael A. Nielsen 和 Isaac L. Chuang 著《量子计算与量子信息：10 周年版》，孙晓明等译，电子工业出版社，2022.2 Textbook: Michael A. Nielsen and Isaac L. Chuang, Quantum Computation and Quantum Information: 10th Anniversary Edition