

课程大纲 COURSE SYLLABUS

1.	课程代码/名称 Course Code/Title	PHY5020/量子光学 Quantum Optics
2.	课程性质 Compulsory/Elective	专业必修课 Degree Required 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)	杨兵 Bing Yang
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 I 和 II/Quantum Mechanics PHY206-15 and 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.) 量子光学, 是现今光量子技术的基础, 是结合光学、量子力学及原子分子光学的一门新兴学科。本课程结合光场的量子理论和光与原子相互作用的模型, 介绍基本的量子光学概念及物理定律, 以及冷原子物理和量子信息基础。 Quantum optics is the fundamentals of the photonic quantum technology, which is rapidly developing nowadays. It is a newly developed subject, which combine optics, quantum mechanics and atomic, molecular and optical physics. Based on the quantum theory of light and the interaction model of atoms and light, this course aims to introduce the fundamental physical models and concepts in quantum optics, also the cold-atom physics and quantum information processing.
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.) 授课为主, 兼采用课堂讨论、专题调研及小组汇报等方式 Mainly lecture talks, combined with course discussion, topic study and presentation.
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	量子光学简介 Introduction to quantum optics
	Section 2	光场的量子化

	Field quantization
Section 3	相干态 Coherent states
Section 4	光和原子相互作用 Atom-field interaction
Section 5	光子统计 Photon statistics
Section 6	场-场、光子-光子干涉，关联函数 Field-field and photon-photon interferometry, correlation function.
Section 7	非经典光场 Nonclassical light
Section 8	冷原子物理 Cold-atom physics
Section 9	量子信息基础 Quantum information processing
11. 课程考核 Course Assessment	
	<p>(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.)</p> <p>平时作业: 50%; 笔试: 50%。 Assignment: 50%; Final Exam: 50%.</p>
12. 教材及其它参考资料 Textbook and Supplementary Readings	
	<p>Quantum Optics, Mark Fox, Oxford University Press (2006) Introductory Quantum Optics, Christopher Gerry and Peter Knight, Cambridge University Press (2005) Quantum Optics, Marlan O. Scully and M. Suhail Zubairy, Cambridge (1997). The quantum theory of light (3rd), Rodney Loudon, Oxford Science Publications. A guide to experiments in quantum optics (2nd), Hans-A. Bachor and Timothy C. Ralph, WILEY-VCH.</p>