UNIVERSITÀ DI PAVIA

Anno Accademico 2020/2021

QUANTUM OPTICS

Enrollment year	2019/2020
Academic year	2020/2021
Regulations	DM270
Academic discipline	FIS/03 (MATERIAL PHYSICS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	Fisica delle tecnologie quantistiche
Year of study	2°
Period	1st semester (05/10/2020 - 20/01/2021)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	MACCONE LORENZO (titolare) - 6 ECTS
Prerequisites	Quantum Mechanics and electromagnetism (at undergraduate level). The first part of the course will be devoted to a revision of all the necessary notions, also to fix the notation that will be used in the course.
Learning outcomes	Gaining a “physical intuition” on Quantum Mechanics using Quantum Optics as a tool to that aim; training for research (acquisition of working knowledge): calculation and simulation techniques, analysis and mathematical description of experimental devices, estimation theory.
Course contents	The first lecture of the course will introduce the whole course, so all interested students are welcome to that lecture. 1. Revision of quantum mechanics (to fix the notation and the formal system), revision of classical electromagnetism. 2. Quantization of the free electromagnetic field and matterfield interactions through the minimal coupling Hamiltonian.

	3. Algebric methods for quantum mechanics. 4. Quantum states of radiation. 5. Quantum interference and quantum superposition (various topical quantum optics experiments will be analyzed). 6. Open quantum systems (Master equations and CPmaps). 7. Detection theory in quantum optics. Further details and the course register can be found on the course web site: http://otticaquantistica.it/people/maccone/otticaq/
Teaching methods	The lectures are blackboardlectures (no powerpoint). Some of the more advanced topics are optional and will not be requested at the exam unless the student chooses to be evaluated on them. Interactions (questions, observations and feedback) are encouraged.
Reccomended or required readings	Scully, Zubairy, “Quantum Optics”, Cambridge University Press; Gerry, Knight, “Introductory Quantum Optics”, Cambridge University Press; Further elaborations: Mandel, Wolf, “Optical Coherence and Quantum Optics”, Cambridge University Press. (All the above texts are present in the department library.)
Assessment methods	Oral examination. The exam will reveal the comprehension of the subject matter and the capacity of autonomous elaboration and of presentation. The pure memorization of the subject is strongly discouraged and will be negatively evaluated. Please contact the teacher to fix the examination date.
Further information	The course web site contains the detailed topics of each lecture and all practical announcements: http://otticaquantistica.it/people/maccone/otticaq Contact the teacher for any necessities. The lectures given in the academic year 15/16 are available online at: http://otticaquantistica.it/people/maccone/otticaq/quantum-optics-videos/
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