UNIVERSITÀ DI PAVIA

Anno Accademico 2017/2018

QUANTUM OPTICS

Enrollment year	2017/2018
Academic year	2017/2018
Regulations	DM270
Academic discipline	FIS/03 (MATERIAL PHYSICS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	Fisica teorica
Year of study	1°
Period	1st semester (02/10/2017 - 19/01/2018)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian or English upon request (with general agreement)
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.
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.
Teaching methods	The lectures are blackboardlectures (no powerpoint). 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	Contact the teacher for any necessities. The lectures given in the academic year 15/16 are available online at: http://www.meccanicaquantistica.it/people/maccone/video.html
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile