Imperial College London

Module Specification (Curriculum Review)

Basic details

UID		Cohorts covered	Earliest cohort: 2024-25; Latest cohort:
Long title	Quantum Systems 2: Hybrid Quantum Systems		
New code	PHYS70058	New short title	
Brief description of module *(approx. 600 chars.)*	The course has three themes: Quantum Photonics, Optical Quantum Information, Matter Qubits and Oscillators. In addition there are two extended laboratory experiments on laser cooling and on photon correlations. (211 characters)		
Available as a standalone module/ short course?	N		

Statutory details

	ECTS	CATS	Non-credit		
Credit value	7.5	15	N	HECOS codes	
FHEQ level	Level 7				

Allocation of study hours

	Hours	
Lectures	21	
Group teaching	3	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	31	
Other scheduled		*Incl. project supervision, fieldwork, external visits.*
Independent study	132.5	*Incl. wider reading/ practice, follow-up work, completion of assessments, revisions.*
Placement		*Incl. work-based learning and study that occurs overseas.*
Total hours	187.5	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed?	No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Term 2	Other	

Ownership

Primary department	Physics
Additional teaching departments	
Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	N
External institution	N/A

External department	N/A
External campus	N/A

Associated staff

Role	CID	Given name	Surname
Module Leader		Steve	Kolthammer
Topic Leader		Steve	Kolthammer
Topic Leader		Michael	Vanner
Topic Leader		Malcolm	Connolly

Learning and teaching

Module description

Learning outcomes	On completing this module, students will be able to: - understand atomic quantum memories and compare various storage schemes, including analysis of optical cavities. - describe, calculate with a statistical description, and demonstrate in the laboratory aspects of optical detection with reference to single photon experiments. - assemble and implement a magneto-optical trap for Rb and discuss its application to quantum phemonema. - summarise continuous and discrete variable encodings in optical quantum information. - describe quantum key distribution and calculate Bell's inequality protocols for optical quantum information. - describe superconducting circuits as qubits, quantum dots as qubits, and contrast these with atoms. - explain the physics of macroscopic quantum oscillators.
Module content	Quantum Systems 2 covers three main themes: quantum photonics, optical quantum computing, and matter qubits. It also includes two laboratory experiments, one on atom trapping and the second on photon correlations.
Learning and Teaching Approach	The three themes will be delivered by lectures. The lab experiments will be delivered as practical work, with support from demonstrators and the topic leader.
Assessment Strategy	A final two hour written examination provides summative assessment (60% of the overall mark). Three problem sheets provide summative assessment and formative assessment through detailed marking and solution sheets (20%). Problem sheets will be spaced through the course to coincide with each main theme, each with it's own feedback session. The practical laboratory work will be marked by a combination of continuous assessment (6%) and a written report (14%).
Feedback	Feedback will be provided by marked problem sheets and a one hour feedback session for each sheet. For each lab experiment a post-lab meeting will provide formative assessment. Feedback for the laboratory component will be provided by the demonstrators as the lab progresses.
Reading list	

Quality assurance

Date of first approval

Office use only

QA Lead

Date of last revision		Department staff	
Date of this approval		Date of collection	
		Date exported	
Module leader	Steve Kolthammer	Date imported	
Notes/ comments			

Template version 16/06/2017