

Basic details

UID	<input type="text"/>	Cohorts covered	Earliest cohort <input type="text" value="2025-26"/>	Latest cohort <input type="text"/>
Long title	<input type="text" value="Advanced Quantum Information"/>			
New code	<input type="text" value="PHYS70059"/>	New short title	<input type="text"/>	
Brief description of module <i>(approx. 600 chars.)</i>	<input type="text" value="This module introduces students to the theory of quantum information and its algebraic foundations. The three main sections of the module are quantum algorithms, theory of entangled states and quantum error correction."/>			
	219 characters			
Available as a standalone module/ short course?	<input type="text" value="N"/>			

Statutory details

Credit value	ECTS <input type="text" value="5"/>	CATS <input type="text" value="10"/>	Non-credit <input type="text" value="N"/>	HECOS codes	<input type="text"/>
FHEQ level	<input type="text" value="Level 7"/>				<input type="text"/>
				<input type="text"/>	<input type="text"/>

Allocation of study hours

	Hours	
Lectures	<input type="text" value="22"/>	
Group teaching	<input type="text"/>	<i>Incl. seminars, tutorials, problem classes.</i>
Lab/ practical	<input type="text"/>	
Other scheduled	<input type="text"/>	<i>Incl. project supervision, fieldwork, external visits.</i>
Independent study	<input type="text" value="103"/>	<i>Incl. wider reading/ practice, follow-up work, completion of assessments, revisions.</i>
Placement	<input type="text"/>	<i>Incl. work-based learning and study that occurs overseas.</i>
Total hours	<input type="text" value="125"/>	
ECTS ratio	<input type="text" value="25.00"/>	

Project/placement activity

Is placement activity allowed?

Module delivery

Delivery mode	<input type="text" value="Taught/ Campus"/>	Other	<input type="text"/>
Delivery term	<input type="text" value="Term 2"/>	Other	<input type="text"/>

Ownership

Primary department

Additional teaching departments

Delivery campus

Collaborative delivery

Collaborative delivery?

External institution

External department	N/A
External campus	N/A

Associated staff

Role	CID	Given name	Surname
Module Leader		Florian	Mintert

Learning and teaching

Module description

Learning outcomes	<p>At the end of this module, students will be able to:</p> <ul style="list-style-type: none"> - explain theory and applications of quantum information with rigorous mathematical footing. - understand the algebraic concepts of quantum information theory, including quantum algorithms, entanglement theory and quantum error correction. - distinguish and apply quantum algorithms including period finding, the hidden subgroup problem and quantum fourier sampling. - explain how entanglement theory includes notions of locality and causality, convex sets of quantum states and manipulation of quantum states by local operations. - apply quantum error correction including the stabilizer formalism and measurement-based quantum computation.
Module content	The modules contains advanced notions of quantum algorithms, entanglement theory and quantum error correction. Topics include single qubits and quantum gates, the dynamics of qubits, and error correction protocols.
Learning and Teaching Approach	This module will be delivered by lectures with problem sets for the students to solve.
Assessment Strategy	The assessment will be based on a two hour written examination and assessed problem sheets. The written examination contributes 70% and the problem sheets contribute 30%.
Feedback	Feedback will be provided by model answers to the problem sheets.
Reading list	

Quality assurance

Date of first approval	
Date of last revision	August 2023
Date of this approval	

Module leader **Florian Mintert**

Office use only

QA Lead	
Department staff	
Date of collection	

Date exported
Date imported

Notes/ comments



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