

Basic details

UID	<input type="text"/>	Cohorts covered	Earliest cohort <input type="text" value="2025-26"/>
Long title	<input type="text" value="Quantum Systems 1: Cold Atomic Systems"/>		
New code	<input type="text" value="PHYS70057"/>	New short title	<input type="text"/>
Brief description of module <i>(approx. 600 chars.)</i>	<input type="text" value="The module covers atomic physics, angular momentum in atoms and molecules, molecules and ions."/>		
Available as a standalone module/ short course?	<input type="text" value="N"/>		

Statutory details

Credit value	<input type="text" value="5"/>	<input type="text" value="10"/>	<input type="text" value="N"/>	HECOS codes
FHEQ level	<input type="text" value="Level 7"/>			

Allocation of study hours

	Hours	
Lectures	<input type="text" value="26"/>	
Group teaching	<input type="text" value="5"/>	<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="94"/>	<i>Incl. wider reading/ practice, follow-up work, completion of assess</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 1"/>	Other	<input type="text"/>

Ownership

Primary department	<input type="text" value="Physics"/>
Additional teaching departments	<input type="text"/> <input type="text"/>
Delivery campus	<input type="text" value="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		Ben	Sauer
Topic Leader		Mike	Tarbutt
Topic Leader		Stefan	Truppe

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"> - evaluate the quantum structure of one and two electron atoms and be able to apply techniques to the coupling of angular momentum in atomic systems and processes - describe and evaluate Doppler, sub-Doppler and evaporative cooling processes in molecular and ionic systems. - describe the energy level structure of atoms and molecules and evaluate the differences between these levels. - explain the principles of electric decelerators and traps, optical traps and magnetic trap properties and analyse the motion of trapped particles. - explain the processes by which molecules can be formed at low temperature by cold atoms. - explain the techniques by which ions are trapped and used for measurement and quantum information processing.
Module content	The module covers atomic physics, including basic structure and atom-light interactions, momentum in atoms and molecules, laser cooling and trapping of atoms, Bose-Einstein condensates, the physics of ion trapping, cold molecules and cold ions.
Learning and Teaching Approach	The course will be delivered by lectures. There are four main themes which build on atomic physics, cold atoms, molecules, then ions. Each theme will have a problem set to consolidate learning. Model solutions and peer review will be used to further consolidate understanding of the material.
Assessment Strategy	The assessment will be by problem sheets (20%) and a two hour written examination. The problems sheets will follow the lectures that make up the particular theme it covers. The problems will be assessed using a mixture of peer assessment and expert review. The examination questions will contain some material that cuts across the themes so that the students have a holistic view of the subject matter.
Feedback	Summative feedback will be provided by marked problem sheets that are returned at the end of the module progresses. The peer assessment, detailed marking and solution sheets provide formative feedback. There will be opportunities for formative feedback during weekly office hours. These office hours will also be an opportunity to answer questions from students and provide clarification of any areas that are found to be difficult.

Reading list

Fitch, Truppe and Tarbutt, Quantum Systems I Lecture Notes;
Cohen Tannoudji, Quantum Mechanics;
Griffiths, Introduction to Quantum Mechanics;
Foot, Atomic Physics;
Edmonds, Angular Momentum in Quantum Mechanics;

Quality assurance

Date of first approval

Date of last revision

July 2025

Date of this approval

Module leader

Ben Sauer

Notes/ comments

Office use only

QA Lead

Department staff

Date of collection

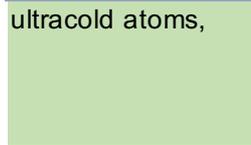
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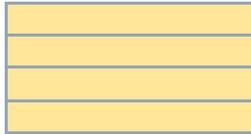
Template version

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Latest cohort



111 characters



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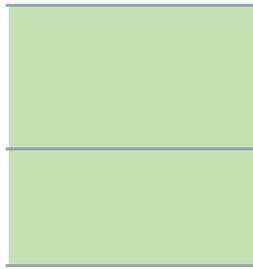
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