Imperial College London

Module Specification (Curriculum Review)

Basic details

			Earliest cohort	Latest cohort
UID		Cohorts covered	2024-25	

Long title: Quantum Field Theory

New code: PHYS70008 | New short title:

Brief description of module *(approx. 600 chars.)*:

QFT (Quantum Field Theory) is essential to understand nature at the smallest scales. The success of the standard model of particle physics requires QFT. QFT is also important in condensed-matter systems such as ultra-cold atom condensates. In this module, we will look at the simplest relativistic free fields, scalar fields, the Maxwell field and the Dirac fermion and their quantizations. For interacting scalar fields we will develop the theory underlying the use of Feynman diagrams to describe physical processes using perturbation theory.

545 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	26	
Group teaching	10	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	0	
Other scheduled	20	*Incl. project supervision, fieldwork, external visits.*
Independent study	131.5	*Incl. wider reading/ practice, follow-up work, completion of assessments, revisions.*
Placement	0	*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: | Other: Term 1, exam in term 3

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		Toby	Wiseman

Learning and teaching

Module description

Learning outcomes	On completing the Quantum Field Theory course, students will be able to: • Provide some motivation for the use of fields to describe fundamental particle physics. • Describe a scalar (spin zero) and spin half fermion particle in terms of a classical field theory. • Quantise these field theories using canonical quantisation. • Understand interactions in the scalar theory using perturbation theory.
Module content	1 Introduction 2 Classical Field Theory 3 Quantising a free scalar field theory and Maxwell theory 4 Perturbative interactions and scattering for scalars 5 Quantising a free Dirac fermion
Learning and Teaching Approach	Lectures are supported by problems (with detailed solutions) and a complete set of lecture notes. There are weekly office hours with the lecturer. Supported by formative assessment in the form of written feedback on key written exercises set every week. Solutions to these problems presented by a PhD student giving alternative viewpoint and another expert contact point for students.
Assessment Strategy	100% summative assessment based on a two-hour exam covering all learning outcomes.
Feedback	The teaching assistant leading the problem-solving sessions returns student scripts with written feedback by the time solutions are presented. The lecturer provides detailed notes on how students tackled the final exam.

Reading list	No text is compulsory. The main recommendation is: •M. Peskin and D. Schroder, "Introductoion to Quantum Field Theory" CRC Press, 2018. A long list of many suitable texts with descriptions and recommendations is provided in-course.

Quality assurance

Date of first approval	
Date of last revision	
Date of this approval	
Module leader	Toby Wiseman
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Template version 16/06/2017

Programme structure
Associated modules

UID	Legacy code	Module title	Requisite type
		Advanced Classical Physics	Prerequisite
		Foundations of Quantum Mechanics	Prerequisite

UID	Legacy code	Module title	Requisite type

Assessment details

		Pass mark
Grading method	Numeric	50%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination	2 hour written exam	100%	50%	N
		100%		