

Unification

Module Code	PHYS97102	FHEQ Level	Level 7
Pre-requisites	Advanced Classical Physics, Group Theory, Physics of the Universe	Co-requisites	Quantum Field Theory
Primary Department	Physics		
Module Leader	Professor Arttu Rajantie		
Additional Teaching Departments	None		
Teaching Staff	Professor Arttu Rajantie + Course Associate		
Programmes on which the Module is delivered			Core/Elective
All UG Physics programmes (F300, F303, F309, F325, F390, F3W3)			Elective
Learning Outcomes	<p>On completing the Unification course, students will:</p> <ul style="list-style-type: none"> • know the properties required for the Lagrangian of a field theory • be able to derive the equations of motion from a field theory Lagrangian • know the difference between global and local symmetries • be able to find the conserved currents associated with a symmetry • be able to find the particle spectrum of a classical field theory consisting of scalars, vectors and spinors • understand broken and unbroken global and local symmetries are reflected in the particle spectrum • know how Dirac and Weyl spinors transform under Lorentz transformations • know the symmetry group of the Standard Model of particle physics • be able to write down the Standard Model Lagrangian • understand how the form of the Standard Model Lagrangian follows from symmetries • be able to determine the main parameters of the Standard Model from its particle spectrum 		
Description of Content	<ul style="list-style-type: none"> • Scalar, spinor and vector fields • Global and gauge symmetries • Abelian and non-Abelian symmetries • Noether's theorem and conservation laws • Yang-Mills theory • Spontaneous symmetry breaking and Goldstone's theorem • Higgs mechanism and the Higgs boson • Electroweak unification • The Standard Model Lagrangian • Symmetries of the Standard Model 		

Assessment		Assessment Type	Weighting
Written Exam		Exam	100%
Learning & Teaching Hours	Independent Study Hours	Placement Hours	Total Hours
57	143	0	200
ECTS Credit	8	CATS Credit	16
Date of introduction	October 2016	Date of Last Revision	April 2021