University of Pretoria Yearbook 2022

Quantum field theory 717 (PHY 717)

Qualification	Postgraduate
Faculty	Faculty of Natural and Agricultural Sciences
Module credits	10.00
NQF Level	08
Prerequisites	Admission only by permission of the Head of the Department of Physics
Contact time	2 lectures per week
Language of tuition	Module is presented in English
Department	Physics
Period of presentation	Semester 2

Module content

Special relativity. Representation of transformations in quantum physics. Canonical quantisation of free scalar fields. Interactions, scattering and the reduction formula. Path integrals in quantum mechanics; the harmonic oscillator. Free fields. Interacting fields, perturbation theory and Feynman diagrams. Scattering amplitudes and the Feynman rules. Renormalisation: Dimensional analysis, the exact propagator, the exact three point vertex, higher order corrections and perturbation theory to all orders. Symmetry: Continuous symmetries and conserved currents, discrete symmetries. The renormalisation group: Infrared divergences, different renormalisation schemes and asymptotic freeness, the renormalisation group. Spontaneous symmetry breaking: A discrete example, a continous example, the Goldstone boson.