

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 freedom, the renormalisation group. Spontaneous symmetry breaking: A discrete example, a continuous example, the Goldstone boson.

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