

# Theoretical Elementary Particle Physics (QFT II) WS2018/2019

## **Lecturers**

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## **Assistant**

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## **Website**

*<https://wwwth.kph.uni-mainz.de/ws201819-theoretische-elementarteilchenphysik-qft-ii/>*

## **Lecture hours**

Monday, 12:00 - 14:00 (Newton Room 01-122)

Thursday, 14:00 - 16:00 Uhr (Newton Room 01-122)

# Topics

## Part I: Foundations

- Abelian and non-abelian gauge theories, Feynman rules
- Path Integral Quantization: quantum mechanics, field theory: bosons, fermions
- Path Integral Quantization of abelian and non-abelian gauge theories
- Loop diagrams and renormalization
- Running coupling constant and asymptotic freedom

## Part II: Applications

- Quantum chromodynamics and the parton model: deep inelastic lepton-nucleon scattering, structure functions, spin of nucleon
- Quantum chromodynamics in the non-perturbative regime: implications of unitarity, dispersion relations
- Standard Model of electroweak interactions: foundations, Higgs mechanism, precision tests
- Neutrino Physics

## Literature

- M.E. Peskin and D. V. Schroeder,  
**An Introduction to Quantum Field theory**  
(Westview Press, Boulder, 1995).
- M. Srednicki,  
**Quantum Field Theory**  
(Cambridge University Press, Cambridge, 2007).
- T. Muta,  
**Foundations of Quantum Chromodynamics**  
(World Scientific, Singapore, 1998).
- Matthew D, Schwartz  
**Quantum Field Theory and the Standard Model**  
(Cambridge University Press, 2014)