

Lecture for BSc and MSc:

# Relativistische Quantenmechanik

Sommersemester 2021

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# Dates and structure

➤ Time: Mondays 9.15 - 11.00, Start: Mo 12. April 2021

➤ Lecture for BSc and MSc (@ gHS, ITP, Philosophenweg 12)

Streamed online for all interested students at\

Meeting ID: 235 441 4465

• Passwort: 251882

link: <https://zoom.us/j/2354414465?pwd=Qnh1MFARUkxnenpPdkpsNmmpsUWc1QT09>

(The format may change to presence in June if corona permits.)

➤ If you want to get the 4CPs, you must register @ PhUe:

<https://uebungen.physik.uni-heidelberg.de/v/1319>

and take part in the final written test in July.

Up to 30 participants can register. (There is a waiting list, please send me an email.)

Please inscribe only if you will actually attend the full semester, and plan to take part in the written test at the end of this term. (If you are inscribed and want to step back, send an email to [wolschin@uni-hd.de](mailto:wolschin@uni-hd.de). The restriction is due to corona.)

➤ Prerequisites: Lectures on Quantum Mechanics (TPIV, *can be attended in the same term*).

➤ Language is german, questions (in the chat or live) can be asked in english.

➤ Exercises will be given as homework problems.

➤ 4 ECTS-Credit points for registered students who pass the final written test in July 2021.

## Preliminary Program

Klein-Gordon-Gleichung; Dirac-Gleichung; Invarianzen der Dirac-Gleichung; Interpretation der Operatoren und einfache Lösungen; Bewegung im Coulomb-Potenzial; Nichtrelativistischer Grenzfall der Dirac-Gleichung; Einführung in die Quantenfeldtheorie; Elemente der relativistischen Streutheorie etc.

Klein-Gordon equation; Dirac equation; Invariance properties of the Dirac equation; Interpretation of the operators and simple solutions; Movement in the Coulomb field; Nonrelativistic limit of the Dirac equation; Introduction to Quantum field theory; Elements of relativistic scattering theory etc.

## Literature(selection)

- J.D. Bjorken, S.D. Drell, Relativistic Quantum Mechanics, McGraw Hill 2008.
- A. Messiah, Quantenmechanik, Band II, de Gruyter, 1990.
- C. Itzykson, J.-B. Zuber, Quantum Field Theory, McGraw-Hill, New York, 1980.
- O. Nachtmann, Elementarteilchenphysik, Vieweg, Braunschweig, 1986.
- F. Schwabl, Quantenmechanik für Fortgeschrittene, Springer, Heidelberg, 1997.
- W. Greiner, Relativistic Quantum Mechanics, Springer 1991.
- H.M. Pilkhuhn, Relativistic Quantum Mechanics, Springer 2005.
- A. Wachter, Relativistische Quantenmechanik, Springer 2005.
- G. Wolschin, Relativistische Quantenmechanik, Springer 2015.