



LECTURE COURSE IN THE QUANTUM UNIVERSE RESEARCH SCHOOL

Winter Term 2023/24

Workshop Seminar – Black holes (I)

Course Description:

This is the first of a 2-semester workshop seminar dedicated to the fascinating topic of Black Holes, covering topics in classical general relativity, mathematics, quantum field theory up to string theory, holography as well as astrophysics and cosmology.

Plan for Part I:

- (1) Gravitational collapse – The case for black holes
- (2) Schwarzschild BH and a whiff of singularity theorems
- (3) From Kruskal coordinates to Penrose diagrams
- (4) Singularity Theorems – Classical results
- (5) Singularity Theorems – Modern mathematical description
- (6) Black hole mechanics
- (7) QFT in curved spacetime
- (8) Hawking radiation – Basics
- (9) Modern aspects of Hawking radiation
- (10) Information paradox I: Firewall, Fuzzballs, ER = EPR, ...
- (11) Information paradox II: Firewall, Fuzzballs, ER = EPR, ...

Part II in summer 2024 will be devoted to modern developments such as black holes and holography as well as to astrophysical and cosmological aspects.

Prerequisites:

Basic familiarity with classical gravity and field theory

Date and Place: Tuesday, 11:00-12:30, SR 2, Building 2a, Bahrenfeld

Starting on: 17 October, 2023
