Universität Hamburg
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CHAMPP
CENTER IN HAMBURG FOR ASTRO-, MATHEMATICAL AND PARTICLE PHYSICS

**LECTURE COURSE IN THE QUANTUM UNIVERSE RESEARCH SCHOOL**

**Winter Term 2023/2024**

# Riemannian and Lorentzian Geometry

**Melanie Graf**

**Course Description:**

Some of the most important results in Riemannian Geometry are based on relating local assumptions on the geometry (especially curvature) to the global structure of the space (both regarding topology as well as geometry). While the relevant techniques originate in Riemannian geometry, they have proven extremely useful in the Lorentzian setting as well where the derived results are not only mathematically deep but also immediately physically interesting. The aim of this course is to offer an introduction to global geometric results and techniques in both settings by treating them simultaneously as much as possible. Additional information on the planned topics can be found at `https://grafmelanie.wordpress.com/riemannian-and-lorentzian-geometry/`

**Prerequisites:**

Knowledge of differential geometry as covered in the standard differential geometry course at UHH is required (incl. local semi-Riemannian geometry).

**Literature:**


- J. Beem, P. Ehrlich and K. Easley, Global Lorentzian Geometry, 2nd ed., CRC Press, 1996.
- J. Lee, Introduction to Riemannian Manifolds, 2nd ed., Springer, 2018.
- B. ONeill, Semi-Riemannian Geometry with Applications to Relativity, Academic Press, 1983
- P. Petersen, Riemannian Geometry, 3rd ed., Springer, 2016


**Date and Place:** Mon, 16:15–17:45, Hrsaal H3, Geomatikum
Thu, 12:15–13:45, Hrsaal H3, Geomatikum

**Problem Classes:** Mon, 12:15–13:45, room 205, Sedanstrae 19 (from 23.10.)

**Starting on:** 16 October 2023