



Wintersemester 2022/2023

Vorlesung

# Advanced Topics in Mathematical Relativity (short version)

**Lecturer:** Prof. Dr. Gerhard Huisken

**Start:** Friday, 21st October 2022

**Time:** Fridays 10:15-12:00

**Place:** C 4 H 33

**Study programs:** Master in Mathematics and in Mathematical Physics

**Modul number:** MAT-65-24; 3 ECTS points

## Description:

The course concentrates on geometric variational problems that arise in a natural way in the study of the Einstein evolution equations. This includes the construction of initial data sets, the structure of the constraint equations, concepts for mass, quasi-local mass and center of mass as well as energy inequalities. Techniques developed and employed include PDEs governing conformal changes of metric as well as elliptic and parabolic PDEs describing properties of hypersurfaces and families of hypersurfaces of prescribed mean curvature.

## Prerequisites:

One course on PDEs and one course on Differential Geometry; basic concepts of General Relativity.

## Background literature:

Dan Lee, Geometric Relativity, AMS Graduate studies in Mathematics

Robert Wald, General Relativity

Barrett O'Neil, Semi-Riemannian geometry and applications to General Relativity, Academic Press

Hawking-Ellis, The large-scale structure of space-time, Cambridge Univ. Press

Original articles will also be used.

## Exam:

Oral exam

