Wintersemester 2024/2025

Lecture series

The Ricci Flow of Riemannian Metrics

Lecturer: Prof. Dr. Gerhard Huisken

Start: Friday, 18th October 2024

Time: Fridays, 10:00-12:00

Place: C4H33 (C-Building Mathematik/Physik)

Study programs: Master in Mathematics and in Mathematical Physics

Modul number: MAT- 60-06;   3 ECTS points (Without tutorial)

                                   6 ECTS points (With participation in tutorial)

Tutorial: TBA

Description: The Ricci-flow of Riemannian metrics is a quasi-linear parabolic system of 2nd order partial differential equations that can be used to deform a given Riemannian metric into a simpler geometric shape. It was used in the last thirty years by Hamilton, Perelman and others to prove for example the Poincare-Conjecture and the Geometrisation Conjecture for 3-manifolds. The course introduces into basic properties of the Ricci-flow, develops crucial techniques for understanding the structure of solutions and outlines some of the steps leading to the proof of the Poincare-Conjecture.

Prerequisites:
Bachelor degree or equivalent; equivalent of one course in PDEs and one course in Differential Geometry

Literature:
- Ben Andrews, Christopher Hopper, The Ricci flow in Riemannian Geometry, Lecture Notes in Mathematics, Springer (2011).

- Simon Brendle, Ricci-flow and the Sphere Theorem, Graduate Studies in Mathematics, Volume 111, American Math. Society (2010). - P. Topping, Lectures on the Ricci Flow, London Mathematical Society Lecture Note Series, vol. 325, Cambridge University Press, Cambridge (2006).

- Richard Hamilton, Three-manifolds with positive Ricci-curvature, J. Diff. geom. 17 (1982) 255-306.

- Richard Hamilton, Four-manifolds with positive Curvature Operator, J. Diff. Geom. 24 (1986) 153-179.

- Klaus Ecker, Regurlarity theory of mean curvature flow, Birkhäuser Basel (2004).

- Gary Lieberman, Second order parabolic differential equations, World Scientific (1996).

Exam: Written or oral exam depending on course size.