



**UNIVERSITÄT
HEIDELBERG**
ZUKUNFT
SEIT 1386

Ruprecht-Karls-Universität Heidelberg
Institut für Angewandte Mathematik

Prof. Dr. Angkana Rüland

Im Neuenheimer Feld 205
D-69120 Heidelberg
E-mail: Angkana.Rueland@uni-heidelberg.de
Webpage: <https://www.uni-heidelberg.de/math/rueland/>

20. September 2022

Seminar: Topics in Geometric Measure Theory (Winter term 2022/23)

Lecturers: Prof. Dr. Angkana Rüland, Dr. Antonio Tribuzio

Content:

Consider sets V in \mathbb{R}^n of fixed volume. What is the shape of a domain V such that the size of its boundary (the perimeter) is smallest given the prescribed volume? This question, known as the isoperimetric problem, is a fundamental question in analysis which enters in many important problems and many different variants. As a main objective of the seminar we will work towards answering this question. In approaching this, we will

- study Hausdorff measures and the notion of the Hausdorff dimension,
- prove the isodiametric inequality,
- investigate covering theorems,
- discuss the area and co-area formulas,
- familiarize ourselves with sets of finite perimeter,
- learn about Steiner symmetrisation,
- and prove the isoperimetric inequality.

Further possible topics include applications of these ideas to models in the materials sciences.

Prerequisites: Analysis 1,2; it is possible to participate at the seminar in parallel to attending the lecture "Höhere Analysis". The seminar is addressed both at Bachelor and Master students (with "Binnendifferenzierung"); for Master students functional analysis, a course in PDEs and measure theory are further prerequisites.

Time: Friday, 11:15-13:00 in the Mathematikon (the room will be announced in due time).

Literature: Francesco Maggi, "Sets of finite perimeter and geometric variational problems – An introduction to Geometric Measure Theory", Cambridge University Press, 2012.

Remarks: Please register via MÜSli if you are interested in participating at the seminar. A preliminary meeting in which the topics of the seminar will be distributed will take place on 14.10.2022 at 11:15 pm in the meeting room 2/414. The seminar will be held in English.