

Fractals and geometric measure theory

2025/26 II. Semester

Neptun code: BMETE95MM06

Lecturer: Dr. Balázs Bárány

Prerequisites: This is an elective subject for MSc and PhD students. There are no further prerequisites.

Topics:

- Hausdorff- and box-counting dimension
- Introduction to Iterated Function Systems
- Self-similar sets without overlaps, dimension and measure
- Local dimension, self-similar measures, multifractal analysis
- Projection and slicing theorems
- Overlapping self-similar set, transversality method
- Self-affine sets and measures

Requirements: The subject concludes with a midterm exam on 22nd April (during the lecture). There are two options to complete the subject:

- Writing the 90-minute-long midterm test with two theoretical questions; each question worth 50-50 points.
- Holding a 15-minute-long presentation, which is worked out by the student on his/her own about a recent paper in the field and writing the 90-minute-long midterm test with one theoretical question (chosen out of two). The instructor should approve the presentation's topic. The presentations will be on the day of the midterm or the week before. The student can gain 50-50 points on both the presentation and the midterm.

To pass the subject, 40% of the points must be achieved on the midterm (in the 1st case, 40 points; in the 2nd case, 20 points). For students who did not score 40% on the midterm or want to improve their score, a retake midterm will be held during the week of repeats (from 1st to 5th June).

The final score is the sum of the points from the two theoretical questions on the midterm, or from the presentation and one theoretical question. The final grade based on the earned points is as follows:

- 0—39: fail (1)
- 40—54: pass (2)
- 55—69: satisfactory (3)
- 70—84: good (4)
- 85—100: excellent (5)