

# Geometry and Topology of 3–manifolds

WINTERSEMESTER 2021/22

This course discusses the topology and geometry of manifolds in dimension 3. While 2–dimensional manifolds can be (topologically) completely and easily be classified, and 4–manifolds are (provably) unclassifiable, in dimension 3 there is an abundance of both subtle and interesting behaviour as well as powerful tools.

In this course, we will first develop some basic tools from geometric topology; both specific to dimension 3 and more general. This will lead us to decomposition results that break general 3–manifolds into simpler pieces, which can then be studied using geometry. We will then focus on hyperbolic structures for the rest of the course, which are in some sense both the most abundant as well as most difficult to control.

**Target Audience:** Master’s students in mathematics, TMP students, PhD students in mathematics.

**Prerequisites:** Ideally, participants would know Riemannian geometry and algebraic topology to see and appreciate all connections. However, the only truly required notions are fundamental groups and covering space theory. All other concepts will be introduced and discussed in a specific form during the course.

## Literature:

- Matsuzaki/Taniguchi, “Hyperbolic manifolds and Kleinian groups”
- Thurston, “Three-dimensional geometry and topology”
- Hatcher, “Notes on basic 3-manifold topology”
- Hempel, “3-manifolds”

**Time:** According to the current rules, the class will happen **in person** at the department: *Tuesday, 16:15-18:00* in room B005, and *Friday, 12:15-14:00* in room B051.