

Introduction to Topology

Topology is the mathematical study of continuity and the structure of spaces. Instead of measuring lengths or angles, topology focuses on properties that remain unchanged under continuous deformations such as stretching or bending. A classic example is that a coffee mug and a doughnut are topologically equivalent because each has a single hole. This perspective has made topology one of the central and most influential areas of modern mathematics.

The course begins with the basic concepts of general topology, including topological spaces, continuous maps, compactness, and connectedness. We will then study topological manifolds, spaces that locally resemble Euclidean space but may have a much more interesting global structure. Throughout the course, abstract ideas are supported by examples that develop both mathematical rigor and geometric intuition.

Topology provides a common language for many areas of mathematics and forms an important foundation for differential geometry, algebraic topology, analysis, and mathematical physics. Whether your interests lie in geometry, analysis, algebra, or mathematical physics, this course will give you a deeper understanding of the ideas that connect these subjects.

Exercise: In addition to the lecture, students are encouraged to attend the accompanying exercise course.

Prerequisites: Linear Algebra and Analysis.

Literature:

- John M. Lee, Introduction to Topological Manifolds, Second Edition, Springer (2011).
- Sidney A. Morris, Topology Without Tears.