MATH-220 **Metric and topological spaces**

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Cursus	Sem.	Type
Mathematics	BA3	Obl.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

In metric spaces a distance is defined between each pair of points. In topological spaces, distances are replaced by only a certain notion of nearness. This abstract setting sheds new light upon basic questions: What is continuity? When should we consider two spaces to be equal?

Content

In this course we will study basic notions of point-set topology.

Topology is the minimal structure on a set of points that allows to define a notion of continuity. We will see how this minimal structure is nevertheless rich enough to build up several other geometric concepts like connectedness or compactness. In contrast, we will also discuss how adding a distance function and thereby turning a topological space into a metric space introduces additional concepts missing in topological spaces, like for example completeness or boundedness.

Our basic questions are very simple: how to describe a topological or metric space? When should we consider two such spaces equal, how can we tell when they are different?

Roughly, the course will be in 4 chapters.

1) Topological spaces & continuity
2) Connectedness
3) Compactness
4) Metric spaces and completeness

Throughout the course we will discuss many examples, both to motivate and better understand the somewhat abstract notions.

Learning Prerequisites

Required courses

First year courses in the Bloc "Sciences de base" in EPFL Mathematics Bachelor's program;

Learning Outcomes

By the end of the course, the student must be able to:

- Define topological spaces and their properties
- Analyze topological structures
- Prove basic results in the language of topology

Teaching methods

Lectures and exercise classes.

Assessment methods

written exam

Supervision

Office hours	No
Assistants	Yes
Forum	No

Resources

Bibliography

There are many good books on general topology. For example, here are a few that are available also at the EPFL library:

Introduction to topology, by T. Gamelin et R. Greene;
Topology, Second Edition, by J. Munkres;
Introduction to metric and topological spaces, by W. A. Sutherland

Ressources en bibliothèque

- Topology /Munkres
- Introduction to metric and topological spaces / Sutherland
- Introduction to topology /Gamelin & Greene

Notes/Handbook

There are written notes for the course.

Prerequisite for

Topology; advanced courses in analysis and geometry.