MATH-402 **Combinatorial geometry**

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Cursus	Sem.	Type
Ing.-math	MA1, MA3	Opt.
Mathematics for teaching	MA1, MA3	Opt.
Mathématicien	MA1, MA3	Opt.

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

Can we plant n trees in an orchard, not all along the same line, so that every line determined by two trees will pass through a third? This was raised by Sylvester and has generated interest among mathematicians. It led to the birth of combinatorial geometry with ties to convexity and graph theory.

Content

The course offers an introduction to this rapidly developing field, where combinatorial and probabilistic (counting) methods play a crucial role.
Topics: Extremal graph theory, Repeated distances in space, Arrangements of lines and curves, Geometric graphs, Epsilon nets, Discrepancy theory, Applications in computational geometry.

Keywords

forbidden graph, hypergraph, incidence, arrangement, Vapnik-Chervonenkis dimension, random sampling

Learning Prerequisites

Required courses

Discrete Mathematics

Recommended courses

Probability Theory

Important concepts to start the course

graph, planar graph, random variable, expected value, variance

Teaching methods

Lectures, exercises

Expected student activities

Solving homework problems, answering questions during lecture and exercise sessions

Assessment methods

Written

Supervision

Office hours	Yes
Assistants	Yes

Resources

Bibliography

J. Pach and P. Agarwal: Combinatorial Geometry,
J. Matousek: Lectures on Discrete Geometry

Ressources en bibliothèque

- Combinatorial Geometry / Pach & Agarwal
- (electronic version)
- Lectures on Discrete Geometry / Matousek