EPFL

MATH-504	**Integer optimisation**
	Eisenbrand Friedrich

Cursus	Sem.	Type
Ing.-math	MA2, MA4	Opt.
Mathématicien	MA2	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Oral
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

The course aims to introduce the basic concepts and results of integer optimization with special emphasis on algorithmic problems on lattices that have proved to be important in theoretical computer science and cryptography during the past 30 years.

Content

1. Integer Programming, Polyhedra and the integer hull
2. Complexity and approximation algorithms for classical combinatorial integer programming problems
3. Lattices, Minkowski's Theorem, The LLL algorithm
4. Breaking Knapsack Cryptosystems
5. Transference bounds
6. Integer Programming in fixed dimension
7. Voronoi cells and single exponential time algorithms for shortest and closest vector

Learning Prerequisites

Recommended courses

- Linear algebra 1+2
- Introduction to Algorithms or Discrete Optimization

Assessment methods

Oral Exam

Resources

Bibliography

1. Thomas Rothvoss, Integer Optimization and Lattices
2. Oded Regev, Lattices in Compter Science, Lecture Notes

Moodle Link

- https://go.epfl.ch/MATH-504