

MATH-504 **Integer optimisation**

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

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Lecture	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Remark**

pas donné en 2024-25

**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**

Written exam

**Resources****Bibliography**

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

**Moodle Link**

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

