

MATH-513

**Metric embeddings**

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

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Oral
Workload	150h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Courses	2 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

The course aims to introduce the basic concepts and results on metric embeddings, or more precisely on approximate embeddings. This area has been under rapid development since the 90's and it has strong impact on algorithms for discrete optimization problems.

**Content**

- Metrics:  $l_p$  metrics, distortion
- Dimension reduction by random projections: Johnson-Lindenstrauss lemma
- Streaming algorithms
- Error correction and compressed sensing
- Lower bounds on distortion: Nonembeddability of expanders
- Bourgain's Theorem

**Learning Prerequisites****Recommended courses**

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

**Assessment methods**

Oral

**Resources****Bibliography**

Jiri Matousek: Lecture notes on metric embeddings

**Ressources en bibliothèque**

- [Lecture notes on metric embeddings / Matousek](#)