

	Introduction to Information Theory	Semester 1
Contributes to	MICAS	

Coordinators:	Olivier RIOUL, Telecom Paris Aslan TCHAMKERTEN, Telecom Paris	
Volume:	30h	3 ects
Hours:	Lectures: 18h, Exercises: 9h	
Assessment:	Final Exam	
Language:	English	

Objectives:
The course addresses the two fundamental information questions, namely 'how to compress data efficiently?' and 'how to transfer data efficiently?'

Outcomes:
On completion of the course students should be able to:

- Understand the basics of Shannon's information theory -
- Evaluate optimal trade-offs and Shannon limits for a particular source or channel model

Prerequisite

- Real analysis -
- Introduction to Probability and Statistics

Syllabus

- Source and Channel Models
- Entropy, Relative Entropy (Divergence), Conditional Entropy, Mutual Information
- Data Processing Inequality, Fano's Inequality
- Asymptotic Equipartition Property, Typical Sequences
- Source Coding, Universality -
- Channel Coding, Capacity
- Rate-Distortion
- Joint Source-Channel Coding
- Gambling

Bibliography:

- T.M. Cover and J. A. Thomas, "Elements of information theory", John Wiley & Sons, 2012. -
- A. El Gamal and Y.-H. Kim, "Network Information Theory", Cambridge university press, 2011.