

COM-404 **Information theory and coding**

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Cursus	Sem.	Type
Communication systems minor	H	Opt.
Computer and Communication Sciences		Opt.
Computer science	MA1, MA3	Opt.
Cybersecurity	MA1, MA3	Opt.
Data Science	MA1, MA3	Opt.
Electrical and Electronical Engineering	MA1, MA3	Opt.
Minor in Quantum Science and Engineering	H	Opt.
Quantum Science and Engineering	MA1, MA3	Opt.
SC master EPFL	MA1, MA3	Obl.

Language of teaching	English
Credits	8
Session	Winter
Semester	Fall
Exam	Written
Workload	240h
Weeks	14
<b>Hours</b>	<b>6 weekly</b>
Courses	4 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

The mathematical principles of communication that govern the compression and transmission of data and the design of efficient methods of doing so.

**Content**

1. Mathematical definition of information and the study of its properties.
2. Source coding: efficient representation of message sources.
3. Communication channels and their capacity.
4. Coding for reliable communication over noisy channels.
5. Multi-user communications: multi access and broadcast channels.
6. Lossy source coding : approximate representation of message sources.
7. Information Theory and statistics

**Learning Outcomes**

By the end of the course, the student must be able to:

- Formulate the fundamenal concepts of information theory such as entropy, mutual information, channel capacity
- Elaborate the principles of source coding and data transmission
- Analyze source codes and channel codes
- Apply information theoretic methods to novel settings

**Teaching methods**

Ex cathedra + exercises

**Assessment methods**

With continuous control

**Resources****Websites**

- <http://moodle.epfl.ch/enrol/index.php?id=14593>

**Moodle Link**

- <https://go.epfl.ch/COM-404>