COM-404

# Information theory and coding

Shkel Yanina

| Cursus | Sem. | Type |
|---|---|---|
| Computer and Communication Sciences | | Opt. |
| Computer science | MA1, MA3 | Obl. |
| 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. |

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|---|---|
| Language of teaching | English |
| Credits | 8 |
| Session | Winter |
| Semester | Fall |
| Exam | Written |
| Workload | 240h |
| Weeks | 14 |
| **Hours** | **6 weekly** |
| Courses | 4 weekly |
| Exercises | 2 weekly |
| **Number of positions** | |


## 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