

COM-302

**Principles of digital communications**

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| Cursus                      | Sem. | Type |
|-----------------------------|------|------|
| Communication systems minor | E    | Opt. |
| Communication systems       | BA6  | Obl. |
| Computer science            | BA6  | Opt. |
| HES -SC                     | E    | Obl. |

|                            |                 |
|----------------------------|-----------------|
| Language of teaching       | English         |
| Credits                    | 6               |
| Session                    | Summer          |
| Semester                   | Spring          |
| Exam                       | Written         |
| Workload                   | 180h            |
| Weeks                      | 14              |
| <b>Hours</b>               | <b>6 weekly</b> |
| Courses                    | 4 weekly        |
| Exercises                  | 2 weekly        |
| <b>Number of positions</b> |                 |

**Summary**

This course is on the foundations of digital communication. The focus is on the transmission problem (rather than being on source coding).

**Content**

Optimal receiver for vector channels  
 Optimal receiver for waveform (AWGN) channels  
 Various signaling schemes and their performance  
 Efficient signaling via finite-state machines  
 Efficient decoding via Viterbi algorithm  
 Communicating over bandlimited AWGN channels  
 Nyquist Criterion  
 Communicating over passband AWGN channels

**Keywords**

Detection, estimation, hypothesis testing, Nyquist, bandwidth, error probability, coding, decoding, baseband, passband, AM, QAM, PSK.

**Learning Prerequisites****Required courses**

Signal processing for communications and modèles stochastiques pour les communications

**Important concepts to start the course**

Linear algebra, probability.

**Learning Outcomes**

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

- Estimate the error probability of a communication link
- Design a "physical layer" communication link
- Implement a prototype of a "physical layer" transmitter/receiver via Matlab

**Teaching methods**

Ex cathedra + exercises + project. Lots of reading at home and exercises in class.

### **Assessment methods**

With continuous control

### **Prerequisite for**

Advanced Digital Communications

Software-Defined Radio: A Hands-On Course