

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 - IC	E	Opt.

Language of teaching	English
Credits	6
Session	Summer
Semester	Spring
Exam	Written
Workload	180h
Weeks	14
<b>Hours</b>	<b>6 weekly</b>
Lecture	4 weekly
Exercises	1 weekly
Labs	1 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

### **Resources**

#### **Moodle Link**

- <https://go.epfl.ch/COM-302>

### **Prerequisite for**

Advanced Digital Communications  
Software-Defined Radio: A Hands-On Course