

COM-102

**Advanced information, computation, communication II**

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Cursus	Sem.	Type
Communication systems	BA2	Obl.
Computer science	BA2	Obl.

Language of teaching	English
Coefficient	7
Session	Summer
Semester	Spring
Exam	Written
Workload	210h
Weeks	14
<b>Hours</b>	<b>6 weekly</b>
Lecture	4 weekly
Exercises	2 weekly
<b>Number of positions</b>	

**Summary**

Text, sound, and images are examples of information sources stored in our computers and/or communicated over the Internet. How do we measure, compress, and protect the information they contain?

**Content**

I. How to measure information. Source modeling and probability. Entropy. Source coding and compression. Entropy to analyze algorithms.

II. Cryptography and information security. Modular arithmetic, modern algebra and number theory. The Chinese remainder theorem and RSA.

III. Protecting information. Channel modeling. A few finite fields. Vector spaces. Hamming distance. Linear codes. Reed-Solomon codes.

**Keywords**

Entropy  
 Data compression  
 Number theory  
 Cryptography  
 RSA cryptosystem  
 Linear codes  
 Reed-Solomon codes

**Learning Outcomes**

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

- Understand Shannon's entropy
- Construct an optimal code
- Understand elementary number theory
- Know what an abelian group is
- Recognize a hidden isomorphism
- Know how RSA works
- Know a few linear codes on simple finite fields

**Transversal skills**

- Take feedback (critique) and respond in an appropriate manner.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.

### **Teaching methods**

Ex cathedra with exercises

### **Expected student activities**

Homework (written and grades) ever week.

### **Assessment methods**

Continuous evaluations 10% and final exam 90%

### **Resources**

#### **Bibliography**

"Sciences de l'information", J.-Y. Le Boudec, R. Urbanke et P. Thiran, online

#### **Ressources en bibliothèque**

- [Introduction aux sciences de l'information : entropie, compression, chiffrement et correction d'erreurs / Le Boudec](#)

#### **Moodle Link**

- <https://go.epfl.ch/COM-102>