

## Information Theory (E003600)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0**

**Study time 180 h**

**Course offerings and teaching methods in academic year 2025-2026**

Offering	Language	Location	Teaching Methods
A (semester 2)	Dutch	Gent	
B (semester 2)	English	Gent	seminar lecture

**Lecturers in academic year 2025-2026**

Steendam, Heidi	TW07	lecturer-in-charge
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**Offered in the following programmes in 2025-2026**

Programme	crdts	offering
Bridging Programme Master of Science in Electrical Engineering(main subject Communication and Information Technology )	6	B
Bridging Programme Master of Science in Electrical Engineering(main subject Electronic Circuits and Systems )	6	B
Bridging Programme Master of Science in Bioinformatics(main subject Engineering)	6	B
Bridging Programme Master of Science in Computer Science Engineering	6	B
Master of Science in Electrical Engineering (main subject Communication and Information Technology )	6	B
Master of Science in Electromechanical Engineering(main subject Control Engineering and Automation)	6	B
Master of Science in Electromechanical Engineering(main subject Electrical Power Engineering)	6	B
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	6	B
Master of Science in Bioinformatics(main subject Engineering)	6	B
Master of Science in Electromechanical Engineering(main subject Maritime Engineering)	6	B
Master of Science in Electromechanical Engineering(main subject Mechanical Construction)	6	B
Master of Science in Electromechanical Engineering(main subject Mechanical Energy Engineering)	6	B
Master of Science in Computer Science	6	B
Master of Science in Computer Science Engineering	6	A
Master of Science in Computer Science Engineering	6	B
Master of Science in Electrical Engineering	6	A
Master of Science in Photonics Engineering	6	B
Exchange Programme in Computer Science (master's level)	6	B

**Teaching languages**

English, Dutch

**Keywords**

source coding, channel coding, information

**Position of the course**

This course provides an in-depth treatment of the concepts and principles of information, source coding (compression and quantization) and channel coding (protection against transmission errors). Derivation of the theoretical bounds and study a number of important classes of practical codes.

**Contents**

- Introduction
- Non binary cyclic codes
- Information measures for e.g. communication and machine learning
- Channel models, capacity and channel coding theorem
- Convolutional codes, trellis codes
- Quantization and rate distortion theory

### Initial competences

Communication theory: partim data communication

### Final competences

- 1 Interpret and use information measures.
- 2 Compute theoretical bounds for channel coding and quantization.
- 3 Compute the optimal quantizer.
- 4 Analyse hard and soft decoding.
- 5 Recognize the graphical representation of codes.
- 6 Apply Viterbi decoding.
- 7 Apply error detection and error correction for soft and hard decoding.
- 8 Compute performance.

### Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

### Conditions for exam contract

This course unit cannot be taken via an exam contract

### Teaching methods

Seminar, Lecture, Independent work

### Study material

Type: Syllabus

Name: Information Theory

Indicative price: € 13

Optional: no

Language : English

Number of Pages : 440

Oldest Usable Edition : version of 2023

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : Yes

### References

- J.G. Proakis: Digital Communications (McGraw-Hill), ISBN: 978-0072321111
- S. Benedetto, E. Biglieri : Principles of Digital Transmission (Kluwer Academic / Plenum Publishers), ISBN: 0306457539
- David J. C. MacKay: Theory, Inference and Learning Algorithms (Cambridge), ISBN: 780521644440

### Course content-related study coaching

#### Assessment moments

end-of-term and continuous assessment

#### Examination methods in case of periodic assessment during the first examination period

Written assessment open-book

#### Examination methods in case of periodic assessment during the second examination period

Written assessment open-book

#### Examination methods in case of permanent assessment

Oral assessment, Assignment

#### Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

#### Extra information on the examination methods

During examination period: written open book exam

During semester: graded reports group work and oral defense group work. Second chance: if score less than 8/20: oral examination

### **Calculation of the examination mark**

Evaluation throughout semester as well as during examination period. Special conditions: To determine the total score, the following weights are used: examination: 80% and evaluation throughout semester (group work): 20%, if for none of the parts a score of less than 8/20 was obtained. In case the student has less than 8/20 for one of the evaluation formats, the student cannot pass for the course. In that case, if the weighted score would be 10/20 or more, this will be reduced to 8/20. The score of the evaluation throughout the semester obtained in the first examination period counts in the second examination period for 20% of the total. In case the student is unjustified absent for the group work, the total score (exam + group work) will be maximally 7/20, irrespective of the score for the exam. If different group members clearly show a different degree of input to the group work, then the final mark per student belonging to the same group can still differ