GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

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 2024-2025

A (semester 2)	Dutch	Gent	
B (semester 2)	English	Gent	lecture seminar

Lecturers in academic year 2024-2025

Steendam, Heidi	TW07	lecturer-in-charge

Offered in the following programmes in 2024-2025	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

Position of the course

This course provides an in-depth treatment of the concepts and principles of 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 Interprete 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 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