GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2024-2025

Communication Theory (E012110)

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

A (semester 1)	Dutch	Gent	group work
			lecture

Lecturers in academic year 2025-2026

Noels, Nele	TW07	lecturer-in-charge

Offered in the following programmes in 2025-2026	crdts	offering
Bachelor of Science in Engineering(main subject Computer Science Engineering)	6	A
Bachelor of Science in Engineering(main subject Electrical Engineering)	6	A
Bridging Programme Master of Science in Electrical Engineering(main subject Communication and Information Technology)	6	A
Bridging Programme Master of Science in Electrical Engineering(main subject Electronic Circuits and Systems)	6	A

Teaching languages

Dutch

Keywords

telecommunication, datacommunication, stochastic signals, modulation, source and channel coding

Position of the course

To provide knowledge and insight with respect to basic principles, the operation and performance of modulation and coding techniques for (digital) communication, based upon a statistical description of the relevant signals.

Contents

- Introduction
- Stochastic signals
- Digital transmission: Additive white Gaussian noise channel, Baseband and carrier modulation, Constellation, Linear digital modulation, Eye pattern, Scatter diagram, Bit error probability, Bandwidth requirements
- Source coding: Entropy, Coding of discrete and continuous sources, Lossless and lossy compression, Compression ratio
- Channel coding: Discrete channel, Error correction and detection, Linear block codes, Polynomial block codes, Syndrome computation, Error probability, Error control with feedback, Efficiency of retransmission protocols

Initial competences

Systems and signals, Probability and statistics, and (from academic year 2010-2011) Applied probability

Final competences

1 To have insight in the operation of algorithms for source and channel coding.
2 To master the basic techniques for modulation and detection.
3 To determine the error probability and the bandwidth requirements of simple modulation systems.
4 To evaluate the link quality from eye patterm and scatter diagram.
5 To compute the compression ratio of simple source coding algorithms.
6 To carry out error detection and correction based on syndrome computation.

7 To compute the efficiency of simple retransmission protocols.
8 To be aware of the limitations imposed by the transmission channel on the bit rate and the reliability of the link.

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

Group work, Seminar, Lecture, Independent work

Extra information on the teaching methods

The student acquires individual knowledge for a part of the course, after which a set of self-assessment questions is answered in preparation for a response lecture.
Another part of the course is taught during classical lectures.
During the workshops, exercises are solved by the students under the supervision of a teacher.
In addition, the students independently carry out a group assignment. Interim supervision is provided on request.

Study material

Type: Handouts

Name: Course notes
Indicative price: € 10
Optional: no
Additional information: lecture notes and/or slides (about 10 EUR), also freely available via the online learning platform

References

- J.G. Proakis, Digital Communications. McGraw-Hill, ISBN: 978-0072321111
- B. Sklar, Digital Communications - fundamentals and applications. Prentice-Hall, ISBN: 978-0130847881
- J.R. Barry, D.G. Messerschmitt, E.A. Lee, Digital Communication. Kluwer Academic Publishers, ISBN: 978-0792375487

Course content-related study coaching

The lecturers and assistants are available during contact hours, on appointment and via e-mail.

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

Participation, 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 team work and participation in the self-tests and preparation of the response lectures. Frequency: 1 self-test per week, a report of the team work at end of semester.

Calculation of the examination mark

First examination period: non periodical (graded team work+participation) 20%; periodical (exam) 80%. If both scores are not at least 8/20, the student cannot pass for the course. The end score is then at most 9/20.
Second examination period: written exam counts for 80%, score from team work in first examination period counts for 20%. If the score from the team work in the first examination period is less than 8/20, the student will have to pass an additional

(individual) oral examination on the team work. If the score of the written examination and, if applicable, of the additional oral examination is not at least 8/20, the student cannot pass for the course. The end score is then at most 9/20.