

## Communication Theory (E012110)

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

Credits 6.0 Study time 180 h Contact hrs 60.0 h

Course offerings and teaching methods in academic year 2020-2021

A (semester 1)	Dutch	lecture	30.0 h
		lecture: plenary	20.0 h
		exercises	
		group work	10.0 h

Lecturers in academic year 2020-2021

Moeneclaeys, Marc	TW07	lecturer-in-charge
Noels, Nele	TW07	co-lecturer

Offered in the following programmes in 2020-2021

	crdts	offering
<a href="#">Bachelor of Science in Engineering (main subject Computer Science Engineering)</a>	6	A
<a href="#">Bachelor of Science in Engineering (main subject Electrical Engineering)</a>	6	A
<a href="#">Bachelor of Science in Computer Science Engineering</a>	6	A
<a href="#">Bachelor of Science in Electrical Engineering</a>	6	A
<a href="#">Bridging Programme Master of Science in Electrical Engineering (main subject Communication and Information Technology )</a>	6	A
<a href="#">Bridging Programme Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems )</a>	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 pattern 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, lecture, lecture: plenary exercises

#### Learning materials and price

lecture notes (about 10 EUR)

#### 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.

#### Evaluation methods

end-of-term evaluation and continuous assessment

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

Open book examination

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

Open book examination

#### Examination methods in case of permanent evaluation

Assignment

#### Possibilities of retake in case of permanent evaluation

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. Frequency: 1 report at end of semester.

#### Calculation of the examination mark

First examination period: non periodical (graded team work) 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 the lowest of the two scores.

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 the lowest of the two scores.