GHENT UNIVERSITY

# Course Specifications

From the academic year 2020-2021 up to and including the academic year

## Communication Theory (E012110)

**Due to Covid 19, the education and assessment methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.**

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

**Credits 6.0** **Study time 180 h** **Contact hrs** 60.0h

**Course offerings and teaching methods in academic year 2021-2022**

| | | | | |
|---|---|---|---|---|
| A (semester 1) | Dutch | Gent | lecture: response lecture | 20.0h |
| | | | group work | 10.0h |
| | | | lecture | 30.0h |

**Lecturers in academic year 2021-2022**

| | | |
|---|---|---|
| Noels, Nele | TW07 | lecturer-in-charge |

| **Offered in the following programmes in 2021-2022** | **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**

Online group work, Online lecture, Group work, Guided self-study, Lecture, Online lecture: response lecture, Lecture: response lecture, Online seminar: coached exercises, Seminar: coached exercises

**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.
Because of COVID19 modified work formats (online or on campus) can be rolled out if necessary.

**Learning materials and price**

lecture notes (about 10 EUR), additional audio-visual documents

**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**

Open book examination

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

Open book examination

**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 7/20.
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 7/20.