

Industrial Communication (E745006)

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

Credits 3.0

Study time 85 h

Course offerings and teaching methods in academic year 2023-2024

A (semester 1)

Dutch

Gent

lecture

Lecturers in academic year 2023-2024

Verhaevert, Jo

TW05

lecturer-in-charge

Offered in the following programmes in 2023-2024

crdts

offering

Bachelor of Science in Engineering Technology (main subject Electromechanical Engineering Technology)

3

A

Master of Science in Electromechanical Engineering Technology

3

A

Teaching languages

Dutch

Keywords

Telecommunication, data communication

Position of the course

The course is situated in the learning track in electricity technology and installations and in the learning track drive technology and automation. It has the following objectives:

- Learn the basics and concepts in order to gain insight in modern communication systems, as they are applied in industrial environments
- Understand and be able to analyse different real life case studies: field buses, Personal Area Networks, Wireless Sensor Networks and computer modems

Contents

- Setting and history of communication, description of communication systems, types of communication (types of information, geographical spreading, direction of communication, connection types, topology), OSI reference model
- Analogue and digital signals, bandwidth, sampling (Nyquist theorem) and quantising, PAM, PCM, DPCM, DM, ADPCM...
- Channel properties: transfer function, noise (types of noise, noise figure, noise temperature), signal to noise ratio, channel capacity of Shannon, amplitude distortion and phase distortion
- Electromagnetic propagation, guided waves on telephone lines (distributed parameters, attenuation), on coaxial cable (attenuation) and on optical fibre (internal reflection, fibre types, attenuation)
- Electromagnetic propagation with non-guided waves: radio propagation mechanisms, connection between two antennas, power budget analysis (free space, transmission over the earth)
- Digital communication using base band channel: choice of wave form, choice of pulse form (Unipolar-Bipolar, NRZ-RZ, AMI, Manchester...), more than 2 different wave forms and digital communication using band pass channel (ASK, FSK, PSK, QAM), constellation diagram
- Error coding (parity, two-of-five-code, repetition code, CRC, Hamming, convolution...) and encryption (stream and block encryption, symmetric and asymmetric keys)
- Case study fieldbuses: Profibus, CAN-bus, other standards (KNX, Industrial Ethernet, Foundation Fieldbus)
- Case study Personal Area Networks: RS-232, USB, wUSB, FireWire, Bluetooth, IrDA, RFID, NFC
- Case study Wireless Sensor Networks: IEEE802.15.4, ZigBee, WirelessHart, Z-Wave, WISA
- Case study computer modems: voice band modem, xDSL

Initial competences

Builds upon certain final competences of the courses 'Signalen en Systemen II'

Final competences

- 1 Acquire insight in the basics of communication (with e.g. analogue and digital signals)
- 2 Analyse and interpret channel properties
- 3 Apply practically electromagnetic wave propagation: twisted pair, coax, fibre and wireless communication
- 4 Analyse different types of digital communication: ASK, FSK, PSK and QAM
- 5 Execute properly error coding and encryption
- 6 Understand and explain the design choices of modern industrial communication networks (fieldbuses, PAN, WSN and computer modems)

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

Lecture

Learning materials and price

- Syllabus (7 euro)
- Hand-outs of the slides and additional documentation on the electronic learning environment

References**Course content-related study coaching**

The lecturer is available for further information via various channels (during and after the course, via e-mail or by appointment).

Assessment moments

end-of-term 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**Possibilities of retake in case of permanent assessment**

not applicable

Calculation of the examination mark

Written assessment open-book: 100%