GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2023-2024

Wireless and Mobile Communication (E735019)

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 2023-2024

A (semester 1)	Dutch	Gent	lecture
			practical

Lecturers in academic year 2023-2024

Verhaevert, Jo	TW05	lecturer-in-charge

Offered in the following programmes in 2023-2024	**crdts**	**offering**
Master of Science in Electronics and ICT Engineering Technology(main subject Electronics Engineering)	6	A
Master of Science in Electronics and ICT Engineering Technology(main subject Embedded Systems)	6	A
Master of Science in Electronics and ICT Engineering Technology(main subject ICT)	6	A
Exchange Programme Electronics and ICT Engineering Technology	6	A

Teaching languages

Dutch

Keywords

Wireless communication, mobile communication

Position of the course

The course has the following objectives:

- Apply advanced wireless and mobile communication concepts
- Acquire knowledge and profound insight about the most recent developments in this domain
- Understand and be able to analyse different real life case studies: cellular telephone networks, Personal Area Networks, Wireless Sensor Networks, broadcast networks, wireless computer networks, satellite communication networks

Contents

- Electromagnetic propagation with non-guided waves: radio propagation mechanisms, regulation, radiation and health, connection between two antennas, power budget analysis (free space, transmission over the earth, link budget, link margin)
- Antennas: antenna parameters (antenna gain, radiation pattern, angular width, resonance frequency, bandwidth, antenna impedance, antenna efficiency, EIRP, VSWR), types of antenna, antenna array (phased array, smart antennas)
- Propagation characteristics (characteristic impedance, polarisation), electromagnetic wave propagation, MIMO, indoor positioning (RSSI, TOA, DOA)
- Analogue communication using base band channel and band pass channel (AM, DSB, SSB, VSB, FM, PM)
- Error coding (parity, two-of-five-code, repetition code, CRC, Hamming, convolution...) and encryption (stream and block encryption, symmetric and asymmetric keys)
- Case study cellular telephone networks: cellular system, 2G (system architecture, radio interface, types of channel), 2.5G (HSCSD, GPRS, EDGE), 3G (UMTS), 4G (HSDPA, HSUPA, HSPA, LTE)
- Case study Personal Area Networks: USB, wUSB, FireWire, Bluetooth, IrDA, RFID, NFC
- Case study Wireless Sensor Networks: IEEE802.15.4, ZigBee, WirelessHART, Z-Wave, WISA, 6LoWPAN
- Case study broadcast networks: DAB, DVB
- Case study wireless computer networks: DECT, WiFi, HiperLAN, WiMAX

- Case study satellite communication networks: laws of Kepler, GEO (Astra, Inmarsat), MEO (GPS, Glonass, Galileo), LEO (Iridium, Globalstar)

Initial competences

Builds upon certain final competences of the course 'Datacommunicatie'

Final competences

1 Apply practically electromagnetic wave propagation: wireless communication
2 Analyse different types of analogue communication: AM, FM and PM
3 Execute properly error coding and encryption
4 Understand and explain the design choices of modern wireless and mobile communication networks (cellular telephone network, PAN, WSN, broadcast and satellite)
5 Simulate, realise and measure important aspects in communication networks
6 Research and report of actual information in the field of wireless and mobile communication

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, Practical

Learning materials and price

- 'Wireless Communication Networks and Systems, Global Edition' by Cory Beard and William Stallings, ISBN: 9781292108711 (70 euro)
- Syllabus (10 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 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

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is not possible

Extra information on the examination methods

- Written assessment open-book
- Practical: at the end of each practical an assignment is handed in as report of the obtained results.

Calculation of the examination mark

- Written assessment open-book: 70%
- Practical: 30% Participation in all practicals is mandatory. Unjustified absence will result immediately in the marks 0 for that practical.

When one obtains less than 10/20 for at least one of the parts (practical, lecture), one can no longer obtain a pass mark for the course unit as a whole. If the total score does turn out to be a mark of ten or more out of twenty, this is reduced to the highest fail mark (i.e. 9/20).