Course Specifications
Valid as from the academic year 2019-2020

Wireless and Mobile Communication (E735019)

Course offerings and teaching methods in academic year 2019-2020
A (semester 1) Dutch self-reliant study activities 0.0 h
practicum 24.0 h
lecture 36.0 h

Lecturers in academic year 2019-2020
Verhaevert, Jo TW05 lecturer-in-charge

Offered in the following programmes in 2019-2020
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 ICT) 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: WiFi, HiperLAN, WiMAX
• Case study satellite communication networks: laws of Kepler, GEO (Astra, Inmarsat),

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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, practicum, self-reliant study activities

Extra information on the teaching methods
- Lecture
- Practicum: a number of concepts are practised in small groups.
- Self-reliant study activities: the writing of a review article where scientific literature is read and explored and where a recent wireless and/or mobile communication system is studied.

Learning materials and price
- 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).

Evaluation methods
end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period
Open book examination, oral examination

Examination methods in case of periodic evaluation during the second examination period
Open book examination, oral examination

Examination methods in case of permanent evaluation
Assignment

Possibilities of retake in case of permanent evaluation
examination during the second examination period is not possible

Extra information on the examination methods
- Oral examination with written preparation and open book, where also certain elements of the review article are deepened.
- Practicum: at the end of each practicum session an assignment is handed in as report of the obtained results.

Calculation of the examination mark
- Oral examination: 2/3 of the total marks (of which 1/4 on the review article). No or late submission of the review article results immediately in the marks 0 for that part.
- Practicum: 1/3 of the total marks. Participation in all practica is mandatory. Unjustified absence will result immediately in the marks 0 for that part.

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