

## 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

### **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).