

## High Frequency Systems (E033620)

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

**Credits 6.0**

**Study time 180 h**

**Course offerings in academic year 2023-2024**

A (semester 1)

English

Gent

**Lecturers in academic year 2023-2024**

Bauwelinck, Johan

TW05

lecturer-in-charge

Yin, Xin

TW05

co-lecturer

**Offered in the following programmes in 2023-2024**

**crdts**

**offering**

[Master of Science in Electrical Engineering \(main subject Communication and Information Technology \)](#)

6

A

[Master of Science in Electrical Engineering \(main subject Electronic Circuits and Systems\)](#)

6

A

**Teaching languages**

English

**Keywords**

High frequency systems, wireless systems, system analysis, system design, transmitter architectures, receiver architectures.

**Position of the course**

To gain insight in the operation and the design of high frequency and wireless systems we use daily. Study of the most important aspects that determine the transmitter and receiver performance such as noise, non-linearity, interference, isolation, aliasing, sampling, quantization etc. and how these aspects can be taken into account during the selection and the design of the transmitter/receiver architecture. Practical examples illustrate the different trade-offs and implementations for various communication standards paying attention to new technological and societal needs.

**Contents**

- Intro: examples of high frequency systems, need for modulation, frequency planning and fundamental limitation of information capacity
- Fundamental aspects, analysis techniques and practical approach to system design: noise, non-linearity, frequency conversion, analog-digital conversion and modulation schemes
- Receiver and transmitter architectures, design considerations, practical limitations and solutions
- Short history and evolution of wireless systems

**Initial competences**

Basic analog electronics, signal processing methods and communication systems

**Final competences**

- 1 Gain insight in the structure and the operation of the physical layer of high frequency communication systems.
- 2 Analyze noise, distortion, frequency conversion and digitization in transmitter and receiver subsystems.
- 3 Compare different transmitter and receiver architectures in function of certain system specifications or technological limitations.

**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**

Group work, Lecture, Practical

### **Extra information on the teaching methods**

The lectures offer the necessary background information, analysis and design techniques.

During a number of lab sessions, students gain hands-on experience by building and operating a specific high-frequency system.

### **Learning materials and price**

English slides (non profit), lab notes, supported by book chapters which can be downloaded for free.

### **References**

### **Course content-related study coaching**

### **Assessment moments**

end-of-term and continuous assessment

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

Oral assessment

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

Oral assessment

### **Examination methods in case of permanent assessment**

Participation, Assignment

### **Possibilities of retake in case of permanent assessment**

examination during the second examination period is not possible

### **Extra information on the examination methods**

- During the examination period: oral open-book exam with written preparation.
- During the semester: graded lab sessions. The score obtained for the lab sessions is final, and will be transferred to the second exam session when needed. For organisational reasons, it is not possible to do the lab sessions in the second exam period.

### **Calculation of the examination mark**

Continuous assessment 30%, end-of-term assessment 70%.

If the score of the end-of-term assessment turns out to be a mark of less than 8/20, the weighted average is reduced to 7/20 (if it happens to be higher than this).