

## Applied High Frequency Design (E033631)

**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)

English

Gent

lecture

group work

**Lecturers in academic year 2023-2024**

Torfs, Guy

TW05

lecturer-in-charge

**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 (HF) electronics, design, circuit design, prototyping, circuit debugging, HF measurements.

**Position of the course**

An optional course in the first semester of the master Electrical Engineering. The objective is to train students in the hands-on design of high-frequency electronics by means of a specific, challenging design, which is developed under intensive guidance. For this purpose, several circuits and PCB layouts are realized during the semester and tested with professional measurement equipment. Gaining insight in the detailed operation of the circuits, the trade-offs between conflicting requirements, the influence of non-idealities, parasitics and processvariations, and the application of systematic methodologies for the design and the testing are the central aspects.

**Contents**

This is a course in design. The starting point is a concrete design task with postulated specifications, which the student explores by means of a handbook and of documentation that is specific for this design. Using professional CAD tools active high frequency circuits are devised as well as passive structures such as LC filters, microstrips, couplers and transmission line filters. The design work starts from realistic specifications, uses recent technology, and is carried out in groups of two students or individually. Intensive support is offered by experienced HF design engineers.

**Initial competences**

Basic knowledge of analog electronics. Basic knowledge on high-speed electronics and S-parameters is also recommended.

**Final competences**

- 1 Analyze, specify, design and realize high frequency circuits
- 2 Effectively and creatively use course-specific Computer Aided Design tools for high frequency design
- 3 Account for electromagnetic phenomena when specifying, designing and realizing electronic circuits.
- 4 Specify and perform measurements on high frequency circuits and draw conclusions based on these measurements for the subsequent steps in the design process

**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

### **Learning materials and price**

English slides. English tutorials to the high-frequency CAD tools. An English-language handbook chosen in function of the specific design task.

### **References**

- 1 Kyung-Whan Yeom, "Microwave Circuit Design: A Practical Approach Using ADS", Prentice Hall, 2015, ISBN-13: 978-0-13-408678-1.
- 2 Gilmore, Rowan. and Besser, Les, "Practical RF circuit design for modern wireless systems, Vol. 1: Passive Circuits and Systems, Boston", MA : Artech House, 2003. ISBN: 158053521-6 Location: T57.D.0180 V. 1
- 3 Gilmore, Rowan. and Besser, Les, "Practical RF circuit design for modern wireless systems, Vol. 2: Active Circuits and Systems", Boston, MA : Artech House, 2003. ISBN: 1-58053-522-4 Location: T57.D.0180 V. 1
- 4 Pozar, David, "Microwave engineering", New York, NY, Wiley, 1998. ISBN: 0471170968.

### **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 open-book

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

Oral 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 possible in modified form

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

During examination period: oral open-book exam, written preparation. During semester: graded project reports.

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

Special conditions: The semester work counts for 50% of the final score. The exam, an oral defence on the performed design work with preparation in writing, for 50%. If the score of one of these evaluations turns out to be a mark of less than 8/10, the weighted average is reduced to 7/20 (if it happens to be higher than this).