



**LUNDS UNIVERSITET**  
Lunds Tekniska Högskola

*Course syllabus*

# **Design av trådlösa system**

## **Wireless System Design Principles**

**EITN75, 7,5 credits, A (Second Cycle)**

**Valid for:** 2023/24

**Faculty:** Faculty of Engineering, LTH

**Decided by:** PLED E

**Date of Decision:** 2023-04-11

### **General Information**

**Main field:** Communication Systems.

**Compulsory for:** MWIR1

**Elective for:** C4-ks, D4, E4-ks, MSOC2

**Language of instruction:** The course will be given in English

### **Aim**

The aim of the course is three-fold:

Connect different technologies within the telecommunications area to a complete radio system design, optimized for a realistic transmission channel.

Put a focus on the total cost in order of components, complexity and energy for systems with large number of components, such as IOT-networks.

Illustrate different system and design compromises, such as the trade off between spectrum efficiency, system performance, system cost and energy consumption. This is done with the practical implementation in mind.

Introduce models and show how theoretical analysis, computer simulations and empirical measurements can be used in combination.

### **Learning outcomes**

*Knowledge and understanding*

For a passing grade the student must

- understand how a complete radio system is designed on a schematic level, both in the

- general case and for existing systems,
- understand both the function of building blocks used when designing a radio system, as well as their impact on the overall radio system performance and energy consumption

#### *Competences and skills*

For a passing grade the student must

- be able to perform the basic dimensioning of a radio system, where all parts of a traditional link budget analysis are present,
- be able to make correct reflections about the reasonableness of obtained results when performing such a basic radio system design.
- be able to evaluate the total cost, complexity and energy consumption of a proposed system.

#### *Judgement and approach*

For a passing grade the student must

- be familiar with the terminology used and be able to discuss system design proposals with other engineers in the area
- be able to assess new knowledge in the area and to a certain extent decide on its applicability in a certain system design situation

## **Contents**

The course addresses modern radio systems, their principal design, performance analysis, and the design methodology for both complete systems as well as important sub systems. Radio system design possibilities and limitations are discussed with a starting point in the properties of radio channels. Fundamental building blocks, required to meet different system specifications, are presented and their design is discussed. System requirements considered include data rate, bit error rate, reliability, cost, complexity, energy etc. Both traditional systems for mobile telephony as well as modern wireless systems for data, multimedia communications and Internet of Things (IoT) are addressed. New results in the area are introduced in the form of journal paper studies, which complement the course literature.

## **Examination details**

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment:** The performance assessment has two components. The first part is a series of hand in assignments. The second and grading part is a (five hour) written exam, consisting of both closed book questions and open book problems.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

### **Parts**

**Code:** 0118. **Name:** Examination.

**Credits:** 6,5. **Grading scale:** TH. **Assessment:** Written exam

**Code:** 0218. **Name:** Laboratory Work.

**Credits:** 1. **Grading scale:** UG. **Assessment:** Approved hand in assignments

## **Admission**

**Assumed prior knowledge:** ETT051/EITG05 Digital Communications.

**The number of participants is limited to:** No

**The course overlaps following course/s:** ETIN15

## **Reading list**

- Andreas Molisch: Wireless Communications. John Wiley & Sons Ltd, 2011, ISBN: 978-0-470-74186-3. 2nd Ed.

## **Contact and other information**

**Course coordinator:** Xuesong Cai, [xuesong.cai@eit.lth.se](mailto:xuesong.cai@eit.lth.se)

**Course homepage:** <http://www.eit.lth.se/course/eitn75>