IK2520 Software Defined Radio 7.5 credits

Programvarudefinierad radio

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

On 10/13/2020, the Head of the EECS School has decided to establish this official course syllabus to apply from autumn semester 2021, registration number J-2020-1826.

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Electrical Engineering, Computer Science and Engineering

Specific prerequisites

Completed courses in the following fields:

- signals and systems equivalent to II1303 or EQ1120
- mobile networks and services equivalent to IK2560 or wireless communication systems equivalent to IK2507.

Active participation in a course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course.

Registering for a course is counted as active participation.

The term 'final examination' encompasses both the regular examination and the first re-examination.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

On completion of the course, the student should be able to:

- identify all relevant components of a digital transceiver for software defined radio (SDR) and their relationship
- implement algorithms for basic functionality of a digital transceiver with GNU Radio
- identify performance and hardware requirements for relevant digital transceiver components and through practical testing assess the possibility to implement these in software
- assess performance of different components in a digital communication system and the different algorithms that they are built of
- integrate and test a digital transceiver over antennas with commercial hardware
- design and assess basic algorithms for media access (MAC) and build an own wireless local network
- work and interact in groups.

Course contents

- Platforms for software defined radio: Architecture, flexibility, limitations and current development in the industry and the academia.
- Development environment for digital transceiver design: the framework GNU Radio and different hardware platforms.
- Generation of random number and of sinusoidal signals by means of component based design tools.
- Modulation and decoding: Line code and quadrature modulation, pulse shaping, demodulation with adapted filters, decoding.
- Synchronisation and channel estimation: The AWGN channel, methods for energy maximization, linear equalisation, smoothing parameters, computational techniques.
- Frame detection and frequency correction: correlation based methods, Moose algorithm, use of training sequences.
- Error detection and error correction: Parity codes, check sums, cyclic codes, correction (repetition and redundancy encoding).
- MAC frames, ACK.

- MAC schemes: ALOHA, CSMA/CA, TDMA.

Examination

- INL1 - Assignments, 2.5 credits, grading scale: P, F
- PRO1 - Project, 5.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.