IL2239 Analog-Digital Interfaces 7.5 credits

Analoga-digitala gränssnitt

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

Establishment

The official course syllabus is valid from the Spring semester 2024 in accordance with the decision from the faculty board: J-2024-0538Decision date: 2024-04-16

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Completed course in signals and systems equivalent to EQ1100 course and in integrated electronics equivalent to IL2238.

Language of instruction

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

Intended learning outcomes

After passing the course, the student shall be able to

- explain the basic concepts for analog-digital interfaces
- describe the operation and properties of basic continuous-time (CT) filters, sample-and-hold (SH) and discrete-time (DT) circuits
- describe the operation and properties of basic voltage comparators
- define and calculate critical parameters that influence the performance of data converters
- Explain the concept and operation, and analyze different types of Nyquist-rate digital-to-analog converters (DAC), as voltage-scaling, current-steering and charge-redistribution DAC
- define the concept and operation, and analyze different types of Nyquist-rate analog-to-digital converters (ADC), as integrating, SAR, flash and pipelined ADC
- Define the concept and operation, and analyze basic oversampling sigma-delta ADCs
- choose the appropriate analog-digital interface architecture that is appropriate for a specific application
- design, simulate and analyse an integrated analog-tol-digital converter and use professional CAD tools
- write a report and make an oral presentation on designed circuits and their performance

in order to

- obtain a good understanding of analog-digital interfaces
- acquire knowledge on basic methods and techniques to design and analyze analog-digital interfaces.

Course contents

The overall content of the course covers concepts, operation, analysis and design of analog-digital interfaces and their building blocks. The main focus of the course is on the following topics:

- CT filters
- Voltage comparators
- SH and other DT circuits
- Performance metrics for data converters
- Nyquist-rate digital-to-analog converters
- Nyquist-rate analog-to-digital converters
- Oversampling sigma-delta analog-to-digital and digital-to-analog converters

Examination

- INL1 - Assignments, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- PRO1 - Project, 4.5 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.