FIL3601 Systematic Design of High Performance Analog Circuits 7.5 credits

Systematisk konstruktion av högpresterande analoga kretsar

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

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

Establishment

Course syllabus for FIL3601 valid from Spring 2019

Grading scale

P, F

Education cycle

Third cycle

Language of instruction

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

Intended learning outcomes

The aim of this course is to provide an understanding of, and experience with, the concepts, principles and techniques for designing core high-performance analog circuits, such as amplifiers, which are found in all RF, analog and mixed-signal (AMS) systems.

After completion of the course the students should be able to:

- Explain the basic concepts and principles for systematic design of high-performance analog circuits
- Apply the negative feedback and frequency manipulation techniques for finding optimal amplifier solutions
- Design amplifiers which meet given specificifications. The students should also be able to evaluate the design, conclude if it is the optimal one and develop the design documentation.

Course contents

Knowing how to implement high-performance amplifiers is a fundamental skill for the analog/RF and mixed-signal designers since amplifiers are found in LNAs,mixers, buffers, filters, comparators, integrators, biasing, data converters, etc. The approach of this course is different than the typical textbook approaches in which a library of topologies is available and the designer picks up a circuit and tweaks it until it meets the given specifications. In this course, we teach how to create customized circuit topologies that are designed to meet the given specifications. The amplifier solutions are found through a systematic and structured process that considers the three fundamental performance metrics: noise, bandwidth, and linearity.This approach shows that classic text-book topologies are only part of all the possible solutions, and that their application in a particular situation may be suboptimal. This course makes heavily use of a very powerful concept: the negative feedback. Sophisticated frequency manipulation techniques such as maneuvering poles using phantom zeros will be introduced. The Cadence IC design flow is intensively used in this course.
The theoretical part is covered in lectures (6X2hours) accompanied by a practical part consisting of tutorials on practical circuit design examples (6X2hours).

Specific prerequisites

Examination

- EXA1 - Examination, 7.5 credits, grading scale: P, 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.

4 homework assignments and an individual design project. The project consists of designing a circuit by applying the methodology taught in this course. The results of this project include a written report and and oral presentation, where the design is presented and disscussed.

Grading scale: P/F

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.