EK2390 Project Course in Integrated Circuits for RF and Microwave Technology 7.5 credits

Projektkurs i integrerade kretsar för radioteknik och mikrovågsteknik

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

The official course syllabus is valid from the spring semester 2024 in accordance with the decision by the head of school: J-2023-1953. Date of decision: 2023-10-25

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Knowledge in electrical circuit analysis, 7.5 higher education credits, equivalent to completed course EI1110/IE1206.

Knowledge in analogue electronics, 6 higher education credits, equivalent completed course IE1202/IE1207.

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 should be able to

- describe the underlying key technology of radio-frequency integrated circuits (RFIC) and monolithic microwave integrated circuits (MMIC)
- describe the development chain of integrated circuits from specification, through design and simulation, creation of the photomask (tape-out), production to evaluation and measurement
- design and simulate some important circuit blocks for high-frequency applications, e.g., power amplifiers, phase shifters and frequency mixers
- analyse and estimate design requirements and limitations such as electromagnetic parasitic phenomena, intermodulation and non-linearity, power consumption, etc.
- simulate RFIC/MMIC circuits by means of schematic and layout simulation tools
- create a photomask for the designed circuits suitable for a selected manufacturing methodology
- describe the manufacturing processes that form the basis for the chosen technology in the designed circuits
- describe different measurement settings for different circuit parameter characterisation techniques
- on a general level, characterise and evaluate integrated circuits with regard to their performance, such as amplification, bandwidth, signal reflection
- validate the measurement results that have been received from the laboratory work
- present and defend the results to a critical audience
- work in a small team and take responsibility for the project plan from work breakdown to task assignment to the team members
- give an account of the need of the labour market of this type of engineer competence
- describe the sustainability aspects of modern microelectronics in particular regarding energy efficiency, choice of semiconductor material and product life cycle.

Course contents

The initial lectures on the fundamentals of RFIC/MMIC development with some design examples will be taught by academic staff that are qualified in the subject both in research and industrial applications. The course includes industrial guest lectures. During the project work, weekly progress meetings are held with the assigned teachers.

The course is completed with the final project report and the final presentations.

Examination

- PROA - Project work, 4.0 credits, grading scale: A, B, C, D, E, FX, F
- QUIA - Quiz, 0.5 credits, grading scale: A, B, C, D, E, FX, F
- RAPA - Report, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- TENA - Oral exam, 1.5 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.

Other requirements for final grade

Compulsory attendance at the initial lectures.

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.