

Radio Frequency Integrated Circuits

Programme course

6 credits

Integrerade radiofrekvenskretsar

TSEK03

Valid from: 2017 Spring semester

Determined by

Board of Studies for Electrical
Engineering, Physics and Mathematics

Date determined

2017-01-25

Main field of study

Electrical Engineering

Course level

Second cycle

Advancement level

A1X

Course offered for

- Computer Science and Engineering, M Sc in Engineering
- Applied Physics and Electrical Engineering, M Sc in Engineering
- Electronics Engineering, Master's programme
- Information Technology, M Sc in Engineering
- Applied Physics and Electrical Engineering - International, M Sc in Engineering

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Radio Electronics, Analog CMOS Integrated Circuits.

To follow the course the students are required to have a good knowledge in circuit analysis and design of analog circuits.

Intended learning outcomes

The aim of this course is to give the student fundamental knowledge on Radio Frequency (RF) integrated circuits design. Both system- and circuit perspective is presented in a context of today wireless personal and data communication (such as GSM, CDMA, DECT or Bluetooth). The particular objective of the course is that the student should learn methods and techniques for RF front-end design oriented to CMOS technology. Detailed specifications and limitations for RF blocks are discussed throughout the course. After the course the students should be able to:

- analyze various architectures of today's digital radio transmitters and receivers
- analyze and design basic RF building-blocks in CMOS technology
- verify and optimize RF blocks (circuits) using a professional software
- perform basic RF measurements using professional equipment (such as S-parameters, sensitivity, noise figure, IP₃)

Course content

Review of integrable transceiver architectures and principles of RF CMOS circuit design. Circuit design of basic RF CMOS blocks: low noise amplifier (LNA), mixer, oscillator, frequency synthesizer, power amplifier. Introduction to RF design tools. Practical RF circuit design with professional software. Industrial perspective and future prospects in RF CMOS integrated circuits.

Teaching and working methods

Lectures, tutorials and laboratory work.

Examination

LAB1	Laboratory Work	2 credits	U, G
TEN1	Written Examination	4 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses: VLSI Design Project, Radio Frequency Transceiver Design

Department

Institutionen för systemteknik

Director of Studies or equivalent

Tomas Svensson

Examiner

Ted Johansson

Course website and other links

<http://www.isy.liu.se/en/edu/kurs/TSEK03/>

Education components

Preliminary scheduled hours: 48 h

Recommended self-study hours: 112 h

Course literature

1. Behzad Razavi, "RF Microelectronics", 2nd ed., Prentice-Hall, ISBN 978-0132839419, 2012 (primary book)
2. Thomas H. Lee, "The Design of CMOS Radio-Frequency Integrated Circuits", Cambridge Univ.Press, ISBN 0-521-83539-9, 2004 (supplementary book)

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://stydokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.