Radio Frequency Transceiver Design

Konstruktion av radiotransceivers
6 credits

Programme course

TSEK38

Valid from: 2026 Spring semester

Determined by	**Main field of study**	
Board of Studies for Electrical Engineering, Physics and Mathematics	Electrical Engineering	
Date determined	**Course level**	**Progressive specialisation**
2025-08-28	Second cycle	A1F
Revised by	**Disciplinary domain**	
	Technology	
Revision date	**Subject group**	
	Electrical Engineering	
Offered first time	**Offered for the last time**	
Autumn semester 2011		
Department	**Replaced by**	
Institutionen för systemteknik		

Course offered for

- Master of Science in Applied Physics and Electrical Engineering - International
- Master of Science in Computer Science and Engineering
- Master of Science in Applied Physics and Electrical Engineering
- Master's Programme in Electronics Engineering

Prerequisites

Background in RF electronics, integrated circuits and communication theory.

Intended learning outcomes

The course gives students practical knowledge of the system design of radio frequency circuits for wireless communication. Students learn systematic design methods for receivers and transmitters used in wireless communication systems, such as 3G, 4G, WLAN and Bluetooth. Several aspects at the system level are presented, which requires basic knowledge of radioelectronics circuits. The aim of the course is that the student should learn the design principles of radio frequency systems for current radio standards and existing physical constraints. After the end of the course, the student is expected to:

- analyze radio system and its physical layer (PHY) given specifications from different radio standards,
- transform the system specification to performance requirements for radio circuits for different architectures,
- verify an RF front-end for the required performance using professional software tools.

Course content

Basic radio system design.

Design trade-offs for various radio architectures like superheterodyne, Low-IF, Zero-IF/direct conversion.

Analysis and design of receiver and transmitter systems. Noise analysis, EVM, AGC design, frequency planning, ...

Radio circuits and base band issues. Performance evaluation.

Project and design work with professional tools.

Teaching and working methods

Lectures, laboratory work, seminars, and project assignment.

Examination

LAB1	Laboratory work	2 credits	U, G
PRA1	Project Work	4 credits	U, G

Grades are given as ”Fail” or ”Pass”.

Grades

Two grade scale, older version, U, G

Other information

About teaching and examination language

The teaching language is presented in the Overview tab for each course. The examination language relates to the teaching language as follows:

- If teaching language is “Swedish”, the course as a whole could be given in Swedish, or partly in English. Examination language is Swedish, but parts of the examination can be in English.
- If teaching language is “English”, the course as a whole is taught in English. Examination language is English.
- If teaching language is “Swedish/English”, the course as a whole will be taught in English if students without prior knowledge of the Swedish language participate. Examination language is Swedish or English depending on teaching language.

Other

The course is conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

The planning and implementation of a course should correspond to the course syllabus. The course evaluation should therefore be conducted with the course syllabus as a starting point.

The course is campus-based at the location specified for the course, unless otherwise stated under “Teaching and working methods”. Please note, in a campus-based course occasional remote sessions could be included.

Common rules

Plagiarism

For examinations that involve the writing of reports, in cases in which it can be assumed that the student has had access to other sources (such as during project work, writing essays, etc.), the material submitted must be prepared in accordance with principles for acceptable practice when referring to sources when the text, images, ideas, data, etc. of other people are used. This is done by using references or quotations for which the source is specified. It is also to be made clear whether the author has reused his or her own text, images, ideas, data, etc. from previous examinations, such as degree projects, project reports, etc. (this is sometimes known as “self-plagiarism”).

A failure to specify such sources may be regarded as attempted deception during examination.

Attempts to cheat

In the event of a suspected attempt by a student to cheat during an examination, or when study performance is to be assessed as specified in Chapter 10 of the Higher Education Ordinance, the examiner is to report this to the disciplinary board of the university. Possible consequences for the student are suspension from study and a formal warning. More information is available at Cheating, deception and plagiarism.

Linköping University has also produced a guide for teachers and students' use of generative AI in education (Dnr LiU-2023-02660). As a student, you are always expected to gain knowledge of what applies to each course (including the degree project). In general, clarity to where and how generative AI has been used is important.

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 https://styrdokument.liu.se/Regelsamling/Innehall.