



EQ2410 Advanced Digital Communications 6.0 credits

Avancerad digital kommunikation

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

Establishment

Course syllabus for EQ2410 valid from Autumn 2007

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

For single course students: 180 credits and documented proficiency in English B or equivalent

Language of instruction

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

Intended learning outcomes

The student is required to show the following skills to pass the course:

- Identify and describe different techniques in modern digital communications with applications to wireless transmission, in particular in receivers and equalization, diversity, spread spectrum techniques, OFDM, coding for wireless communications, and CDMA and multiuser systems.
- Identify and describe different standardized technologies in the field, in particular GSM, UMTS/WCDMA and different WLAN standards.
- Describe and motivate the fact that the implementation and development of modern communication technology, in particular in wireless communications, requires mathematical modeling and problem solving.
- Apply mathematical modeling to problems in wireless digital communications, and explain how this is used to analyze and synthesize methods and algorithms within the field.
- Formulate a mathematical model which is applicable and relevant in the case of a given problem.
- Use a mathematical model to solve a given engineering problem in the field, and analyze the result and its validity.

To acquire a higher grade, the student is in addition required to show the following skills:

- Identify and describe different techniques in modern wireless communications, compare different techniques and judge the applicability of different techniques in different situations.
- Formulate advanced mathematical models which are applicable and relevant in the case of a given problem. When explicit assumptions are missing, the student should be able to judge and compare different possibilities and make own relevant assumptions.
- Use a mathematical model to solve a given demanding engineering problem in the field, and analyze the result and its validity.

Course contents

The course is a second course to EQ2310 Digital Communications and focuses on advanced wireless transmission.

Bandlimited Channels: Intersymbol interference, equalization, receiver algorithms.

Fading Radio Channels: Multipath propagation. Flat and frequency-selective fading. Fast and slow fading. Random channel models. Signal design for radio channels. Diversity. Modulation. Coding.

Spread Spectrum Techniques: Introduction to spread spectrum. Direct sequence and frequency hopping. Spreading sequences, receivers. Robustness toward jamming. RAKE-receivers.

OFDM: Introduction to OFDM. Frequency-domain equalization. High bit-rate transmission. Implementation aspects.

Multiuser Communications: Multiuser systems with focus on CDMA. The near-far problem. Power control, multiuser detection, comparison between FDMA, TDMA and CDMA.

Course literature

John G. Proakis, "Digital Communications"

Examination

- TEN1 - Examination, 6.0 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.

Other requirements for final grade

Written examination. 6 cr

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.