IK2509 Digital Communications Theory 7.5 credits

Digital kommunikationsteori

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

Establishment

Course syllabus for IK2509 valid from Autumn 2008

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Language of instruction

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

Intended learning outcomes

The objective of the course is to give the student an in-depth treatment of modern digital communication systems. Upon completion of the course, the student should be able to: - Evaluate digital communication links (spectral properties, bit error rate) in a structured way and evaluate tradeoffs. - Master the theory of digital communication and its benefits as compared to analogue communications. - Perform system simulations (modulation/demodulation methods, bit error rate, and channel models) and compare to the theory covered in the course. - Describe different types of equalization methods and how they solve the problem of intersymbol-interference over communication channels with distortion. - Describe and analyse different types of spread spectrum modulation methods and the advantages they bring to modern communication systems. - Describe and analyze Orthogonal Frequency Division Multiplexing (OFDM) and its suitability for future communication systems. Its advantages and drawbacks as compared to single carrier.

Course contents

- Introduction, representation of bandpass (radio) signals. Equivalent lowpass representation.- Signal space concept, representation of digital communication signals, power spectra of digitally modulated signals.- Detection and performance of digital modulated signals in AWGN channels.- Bandlimited channels, channel modeling, discrete representation of bandlimited channels.- Equalization techniques (linear and nonlinear equalizers), performance of different equalization techniques. Adaptive equalizations.- Fading multipath channels, channel modeling. Digital communication signals through fading multipath channels, link analysis and techniques to improve the performance over such channels.- Multicarrier modulation techniques, the OFDM technique, OFDM versus time domain equalization.- Spread spectrum modulation techniques, direct sequence modulation and frequency hopping modulation.

Course literature

Digital Communications, J. G. ProakisUpplaga: Fourth edition Förlag: McGraw-Hill År: 2001ISBN: 0-07-118183-0 **Undervisningsspråk:** Engelska

Examination

- INLA - Assignment, 4.5 credits, grading scale: A, B, C, D, E, FX, F
- PROA - Take-home exam, 3.0 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

INL1: Homework problems, Grade P/F TEN1: Final exam, Grade AF To pass the course at least 50% score in the exam is needed. The course contains 10 homeworks that give bonus points and can be added to the final exam.

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.