FEO3220 Coding for Wireless Communications 12.0 credits

Kodning för trådlös kommunikation

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

Course syllabus for FEO3220 valid from Autumn 2011

Grading scale

Education cycle

Third cycle

Specific prerequisites

Mandatory prerequisites

- EQ2310 Digital Communications
- EQ2410 Advanced Digital Communications

or equivalent courses.

Recommended

- FE03200 Foundations in Digital Communications
- FEO3210 Information Theory

Language of instruction

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

Intended learning outcomes

After the course the student should be able to:

· Describe the construction, features and operation of modern coding schemes such as low-density parity-check codes and Turbo codes, and decoding algorithms such as the sum-product algorithm, the min-sum algorithm, and the forward-backward algorithm.

· Formulate and use a factor graph representation for describing decoding problems and design of codes on graphs.

· Apply analytical tools, such as density evolution and extrinsic information transfer charts, for performance evaluation and design of modern coding schemes.

· Design and compare different modern coding strategies applied to particular communications scenarios, using appropriate analytical tools for performance analysis, and select a justified best choice of coding scheme.

· Explain important theoretical concepts as well as the impact of code properties on the features of the analytical analysis tools mentioned above.

· Contribute to the research frontier in the area.

Course contents

The course is focused on modern error control coding strategies for wireless communications,with material building on fundamental principles from information theory, communication theory, detection and estimation, and signal processing. A brief outline of the course contents is as follows.

· Channels, codes and capacity

· Low-density parity-check (LDPC) codes and factor graphs

· Iterative decoding on factor graphs

· Convolutional codes and trellis coded modulation

· Turbo codes and iterative decoding

· Serial concatenation and repeat-accumulate codes

· Density evolution and extrinsic information transfer (EXIT) charts

· Error-floor analysis

· Emerging coding strategies

Disposition

Lectures, homework assignments, project assignment, coding research paper presentations

Course literature

Sarah J. Johnson,Iterative Error Correction – Turbo, Low-Density Parity-Check and Repeat-Accumulate Codes, Cambridge University Press, Dec. 2009.

Examination

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

The main focus is onhomework problems. Eachassignmentwill be graded according to (thresholds given are approximate):

-1: less than 5% of assignment solved correctly

0: between 5% and 40% of assignment solved correctly

1: between 40% and 80% of assignment solved correctly

2: more than 80% of assignment solved correctly

There are 11 assignments in total and the threshold for receiving a pass-grade is15 points or more. In addition the student has to successfully complete a

· 30 minutes oral presentation of a coding research paper;

· Project assignment.

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.