



FEO3220 Kodning för trådlös kommunikation 12,0 hp

Coding for Wireless Communications

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Fastställande

Kursplan för FEO3220 gäller från och med HT11

Betygsskala

Utbildningsnivå

Forskarnivå

Särskild behörighet

Mandatory prerequisites

- EQ2310 Digital Communications
- EQ2410 Advanced Digital Communications

or equivalent courses.

Recommended

- FEO3200 Foundations in Digital Communications
- FEO3210 Information Theory

Undervisningspråk

Undervisningspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

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.

Kursinnehåll

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

Kursupplägg

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

Kurslitteratur

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

Examination

Examinator beslutar, baserat på rekommendation från KTH:s handledare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

Övriga krav för slutbetyg

The main focus is on homework problems. Each assignment will 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 is 15 points or more. In addition the student has to successfully complete a

- 30 minutes oral presentation of a coding research paper;
- Project assignment.

Etiskt förhållningsätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.