LUNDS UNIVERSITET
Lunds Tekniska Högskola

Kursplan för läsåret 2001/2002

KODNINGSTEKNIK EDI042

Error Control Coding

Poäng: 5.0 **Betygskala:** TH. **Valfri för:** D4, E4. **Kursansvarig:** Universitetslektor Mats Cedervall.. **Rekommenderade förkunskaper:** Informationsteori (EDI030), Digitalteknik (EIT020).. **Prestationsbedömning:** Godkänt projekt är ett krav för att få tentera. Den skriftliga tentamen (5 tim) är av problemlösningstyp. Som ett alternativ erbjuds möjligheten till muntlig tentamen. **Webbsida:** http://www.it.lth.se/ecc **Övrigt:** Kursen kan komma att ges på engelska.

Mål:
Error control coding should protect digital data against errors which occur during transmission over a noisy communication channel or during storage in an unreliable memory. The last decade has been characterized by not only an exceptional increase in data transmission and storage but also in a rapid development in microelectronics providing us with both a need for and the possibility to implement sophisticated algorithms for error control.

Innehåll:
Introduction: Why error control? Block codes - a primer, a first encounter with convolutional codes, block codes vs. convolutional codes.
Convolutional encoders - structural properties: Convolutional codes and their encoders, the Smith form of polynomial encoding matrices, equivalent and basic encoding matrices, minimal - basic and minimal encoding matrices, minimal encoders, syndrome formers and dual encoders, systematic encoders.
Distance properties of convolutional codes: Distance measures, distances for cascaded convolutional codes, upper and lower bounds on the free distance, lower bound on the distance profile, path enumeration.
Viterbi decoding: The Viterbi algorithm, error probability bounds for convolutional codes, quantization of channel outputs.
List decoding: Decoding with limited resources, list decoding (algorithm, error probability bounds).
Sequential decoding: The Fano metric, the Stack algorithm, computational analysis, the Fano algorithm.
Convolutional encoders with good distance properties: Computing distance spectrum (FAST), some classes of rate R = 1/2 encoders.
Block codes: Reed-Solomon (RS) codes, cyclic codes, discrete Fourier transforms, decoding RS codes (the Berlekamp-Massey algorithm), erasures and errors decoding.
Trellis coded modulation: Band-limited channels and QAM, coding fundamentals,

lattice-type trellis codes, geometrically uniform trellis codes, decoding of modulation codes, precoding.

Litteratur:

Johannesson, R, Zigangirov, KSh: Fundamentals of Convolutional Coding, IEEE Press, 1999.