

Signals and Codes: Exam topics

This course composes of two parts, first one is coding and second one is signal analysis. The exam topics for these parts are following:

Coding

1. Communication channel, binary interface.
2. Source coding, discrete and analog sources.
3. Fixed-length and variable-length codes. Block codes.
4. Unique decodability.
5. Prefix-free codes their analysis and decoding.
6. Kraft inequality.
7. Hamming distance, maximum likelihood decoding.
8. Error detection and correction capabilities of a code. Minimum distance of a block code. Information rate.
9. Binary symmetric channel.
10. Binary linear codes. Hamming weight. Error detection and correction capabilities. Parity check matrix.
11. Hamming codes.

Signals

1. Signal categories (what is a signal, types of signals, ...)
2. Signal parameters (power, energy, average value, mutual power, mutual energy, ...)
3. Harmonic signal properties (Euler formula, complex exponential ...)
4. Time vs. Frequency domain (amplitude, phase shift, one/two sided representation, ...)
5. Fourier series (complex exponential form, constraints, ...)
6. Fourier transform (constraints, relation of FS to FT)
7. Transmission of signal (communication channel)
8. Modulation (Why, when, how, terminology, types)
9. Properties of modulations (bandwidth, energy in modulated signal, S/N or S/C ratios, ...)
10. Analog modulation and demodulation – AM, DSB, SSB, VSB, ISB, FM, PM
11. Sampling and Aliasing (how, why, examples: pulse train ...)
12. Quantization (how, why, errors, examples)
13. Impulse modulation – PAM, PPM, PWM
14. Coded impulse modulation – PCM, DPCM, ADPCM, DM,ADM
15. Analog digital modulations– ASK, PSK, FSK and its variations
16. Combined modulations – QAM and its variations
17. Link coding (how, where, why) – RZ, NRZ, Manchester, ...

Notes:

- Mathematical formulas are required only in basic form; student must understand what he/she is writing down. Minimum required formulas – power, energy, average value, FS (exponential form), FT, convolution (mutual energy), AM + FM + PM modulation.