1. Introduction to Coding Theory: detailed program

- Introduction: some history and motivation.
- Source Coding: alphabets, uniquely ans instantaneously decipherable codes. Rooted Trees, codes and decision problems. Kraft's inequality and McMillan Theorem.
- Probability distributions on sources: Entropy, Gibbs Lemma and Shannon's Noiseless Theorem. The concept of information.
- Channels: Conditional Entropy, Mutual Information and Capacity.
- Block Codes: Information rate and Hamming distance. Error detection and error correction. Minimal distance decoding.
- Linear Codes: generator and parity-check matrices. Syndrome decoding. Correction of erasures.
- Equivalent codes. Duality. Basic code constructions.
- Codes and Channels: Shannon's Noisy channel theorem. Good families of codes.
- Bounds on codes. MDS codes.
- Weight enumerators and MacWilliams equalities.
- Combinatorics: generating functions.
- Combinatorics: Designs and codes.
- Finite Fields.
- Polynomials over finite fields and factorization.
- Cyclic codes: polynomial representation; error trapping decoding. Burst errors.
- Cyclic Codes: Zeros and BCH bound. Decomposition of cyclic codes.
- BCH codes; Reed-Solomon codes; Peterson's algorithm. GCD decoding algorithm.
- Algebraic constructions: Subfield and Trace codes. Delsarte's Theorem.
- Concatenation of codes.
- Convolutional Codes: canonical generators. Viterbi's algorithm.