Faculty of Applied Sciences

INGI2348   Information theory and coding

[30h] 3 credits

This course is taught in the 1st semester

Teacher(s):   Philippe Delsarte (coord.), Benoît Macq
Language: French
Level: Second cycle

Aims

- To explain the notions, methods and results that are used in the analysis and design of information representation, protection and correction systems.
- To present not only general results that determine the possibilities offered by information theory, but also effective compression, security and correction methods.
- To provide some design tools for multimedia (image, sound, data) information coding.

Main themes

- Information representation: decorrelation coding and entropic coding.
- Information security: cryptographic coding.
- Information correction: channel coding theory and error-correcting codes.

Content and teaching methods

- Basic notions in information theory; mutual information and entropy.
- Discrete source coding by fixed length-codes and variable-length codes.
- Decorrelation coding and coding gain notions.
- Basic notions in cryptology; secret-key and public-key cryptographic coding systems.
- Discrete memoryless channel; capacity notion; noisy channel coding theorem.
- General block coding theory; role of the minimum distance.
- Linear codes: generator matrix and parity-check matrix; syndrome decoding.
- Study of certain classes of linear block codes: cyclic codes and Reed--Solomon codes.
- Introduction to convolution codes.

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

- Prerequisite:
(1) FSAB 1101, FSAB 1102, FSAB 1103, FSAB 1104 or equivalent.
- References:
(1) R.G. Gallager, Information Theory and Reliable Communication', Wiley, 1968.
(2) F.J. MacWilliams and N.J.A. Sloane, The Theory of Error-Correcting Codes, North-Holland, 1977.
- Assessment
Written examination (no document allowed)

Miscellaneous

Basic notions in information theory; mutual information and entropy.

Discrete source coding by fixed length-codes and variable-length codes.

Decorrelation coding and coding gain notions.

Basic notions in cryptology; secret-key and public-key
cryptographic coding systems.

Discrete memoryless channel; capacity notion; noisy channel coding
theorem.

General block coding theory; role of the minimum distance.

Linear codes: generator matrix and parity-check matrix;
syndrome decoding.

Study of certain classes of linear block codes: cyclic codes
and Reed--Solomon codes.

Introduction to convolution codes.

Other credits in programs

ELEC22	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(3 credits)
ELEC23	Troisième année du programme conduisant au grade d'ingénieur civil électricien	(3 credits)
ELME22/M	Deuxième année du programme conduisant au grade d'ingénieur civil électro-mécanicien (mécatronique)	(3 credits)
FSA3DS/TL	Diplôme d'études spécialisées en sciences appliquées (télécommunications)	(3 credits)
INFO22	Deuxième année du programme conduisant au grade d'ingénieur civil informaticien	(3 credits)
INFO23	Troisième année du programme conduisant au grade d'ingénieur civil informaticien	(3 credits)
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(3 credits)