

Faculty of Applied Sciences



ELEC2900 Signal processing

[30h+30h exercises] 5 credits

This course is taught in the 2nd semester

Teacher(s): Benoît Macq, Luc Vandendorpe
Language: French
Level: Second cycle

Aims

At the end of this lecture, the students will be able to

- make the link between the analog description of sampling and sequences,
- modify the sampling rate of a discrete time signal i.e., upsample or downsample lowpass or passband signals, deterministic or random; implement these operations by means of efficient structures, in particular polyphase structures,
- understand the consequences of sampling the spectrum,
- design from a spectral template, finite impulse response (FIR) filters by means of different optimum and suboptimum methods,
- design from a spectral template, infinite impulse response (IIR) filters; understand and use the bilinear transform; design filters based on criteria discussed in "INMA2731 : Processus stochastiques",
- design systems for processing multidimensional signals, in particular images,
- understand and use linear transformations for decorrelation, multiresolution analysis, and discriminant analysis

Main themes

Identical to the contents of the course

Content and teaching methods

- Sampling : Shannon sampling theorem ; notions of sequence,
- Sampling rate conversion : interpolation, downsampling, lowpass and bandpass signals, deterministic and random signals,
- Structures and graph theory (introduction), polyphase components,
- Discrete Fourier transform,
- Finite impulse response filters,
- Basics of analog filters and templates,
- Bilinear transform and design of infinite impulse response filters
- Processing of random signals,
- Processing of multidimensional signals,
- Denoising and singularity detection,
- Orthogonal transforms,
- Decorrelative transforms,
- Wavelet transform,
- Linear discriminant transform,
- Non parametric (periodogram) and parametric (process identification) spectral analysis

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

Teaching and learning method :

There will be lectures interleaved with practical training (in teaching room or computation center with MATLAB)

Prerequisites :

INMA2731 : Random processes : estimation and prediction

Assessment :

Written examination about exercices, with notes

Could be given in English

Programmes in which this activity is taught

FSA3DS Diplôme d'études spécialisées en sciences appliquées

Other credits in programs

ELEC22	Deuxième année du programme conduisant au grade d'ingénieur civil électricien	(5 credits)	Mandatory
FSA3DA	Diplôme d'études approfondies en sciences appliquées	(5 credits)	
FSA3DS/EL	Diplôme d'études spécialisées en sciences appliquées (électricité)	(5 credits)	
FSA3DS/TL	Diplôme d'études spécialisées en sciences appliquées (télécommunications)	(5 credits)	
MAP22	Deuxième année du programme conduisant au grade d'ingénieur civil en mathématiques appliquées	(5 credits)	